Methods of engagement; a transdisciplinary learning approach to the problem of the Eerste River

by
Gwendolyn Mary Meyer

Thesis presented in partial fulfilment of the requirements for the degree of Master of Philosophy in Sustainable Development in the Faculty of Economic and Management Sciences at Stellenbosch University

Supervisor: Marthie Kaden, Eve Annecke

March 2016

DECLARATION

By submitting this thesis electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously, in its entirety or in part, submitted it for obtaining any qualification.

Date: March 2016

ABSTRACT

The concern of this study is with the persistent crisis of the Eerste River in Stellenbosch and its relevance in the Anthropocene. In this study, the river is both a lens onto uneven urban development and an instrument for sustainability as a social movement. The thesis makes two proposals. The first activates the river as part of the larger knowledge environment of a watershed and proposes that a watershed is a way to imagine the interrelationships of place. In this way, a watershed as a common *Thing* can activate collective identity and engender care. However, a watershed as a knowledge environment is complex and diverse.

The second proposal of this study is to examine how participatory photography can connect social networks to co-create knowledge about identity in this complex environment. The location for this case study was at the ecologically designed Research Centre in the informal settlement of Enkanini. However, the participatory photography workshop encountered difficulties, and this led to multi-layered methods of engagement in Enkanini that included walking and conversation.

The images from the participatory photography workshop describe an intimate story about a place. When publically exhibited in Enkanini, unexpected audience participation emerged, and the photographs elicited further knowledge. The result is a public visual ethnography of place that could be used in a conversation about the identity of the Stellenbosch watershed. Underpinning the research is the flexible and iterative approach of Transdisciplinary Research Methodology (TDR).

OPSOMMING

Die belang van hierdie studie is in die voortgesette krisis van die Eersterivier in Stellenbosch en sy relevansie in die Antroposeniese tyd. In hierdie studie is die rivier ’n vergrootglas op ongelyke stedelike ontwikkeling en ’n instrument vir volhoubaarheid as ’n sosiale beweging. Die tesis bied twee voorstelle. Die eerste een laat werk die rivier as deel van die groter kennisomgewing van ’n waterskeiding en dit stel voor dat ’n waterskeiding ’n manier is om jou die interverhouding van ’n plek te verbeel. Op hierdie manier is ’n waterskeiding ’n algemene *Ding* wat kollektiewe identiteit kan teweegbring en sorg kan meebring. ’n Waterskeiding as ’n kennisomgewing is egter kompleks en divers.

Die tweede voorstel van hierdie studie is om te ondersoek hoe deelnemende fotografie sosiale netwerke by mekaar kan bring om kennis oor identiteit in hierdie komplekse omgewing saam te skep. Die ligging vir hierdie studie was by die ekologiese ontwerpte Navorsingsentrum in die informele nedersetting van Enkanini. Die slypskool vir deelnemende fotografie het egter probleme ervaar en dit het tot verskeie metodes van betrekking in Enkanini gelei wat rondloop en gesprekke ingesluit het.

Die beelde van die slypskool vir deelnemende fotografie beskryf ’n intieme storie oor ’n plek. Met die openbare tentoonstelling in Enkanini het onverwagse gehoordeelname plaasgevind, en die foto’s het verdere kennis ontlok. Die resultaat is ’n openbare visuele etnografie van ’n plek wat in gesprekke rondom die identiteit van die Stellenbosch-waterskeiding gebruik kan word. Die buigbare en herhalende benadering van Transdissiplinêre navorsingsmetodologie (TDR) vorm die grondslag van hierdie navorsing.

ACKNOWLEDGEMENTS

This research has been possible with generous assistance from the National Research Foundation (NRF) and Distell Corporation support for the participatory photography workshop in Enkanini. A Transdisciplinary Training for Resource Efficiency and Climate Change Adaptation in Africa (TRECCAfrica) grant allowed time to write and do field work on watersheds and socio-ecological resilience at the Institute for Climate and Society in Mekelle, Ethiopia. I would, therefore, like to thank the funders and Professor Mark Swilling, Professor Amaneul Zenebe, Eve Annecke and Nadia Sanetra for promoting me to these funds. The opinions expressed and conclusions arrived at in this study are not necessarily to be attributed to any of these funders.

I would also like to thank the following people and organisations that provided support in this two-year study; De Zalze Estate, the Blaauwklippen River Forum and Susan Immelman for their collaboration. I am very appreciative of Marthie Kaden and Eve Annecke for their supervision and John van Breda for his guidance. The writing lab tutors at Stellenbosch University proved invaluable as did the Design Research Activities Group (DRAW) at the Cape Peninsula University of Technology where I met Ezio Manzini and where I presented work in progress twice. For collegiate support, my thanks to Lorraine, Robin, Claire and Nikki. My appreciation goes to Beatrix for her unwavering administrative guidance and encouragement and my gratitude to friends and family who supported me in this journey.

The financial assistance of the National Research Foundation (NRF) towards this research is hereby acknowledged. Opinions expressed and conclusions arrived at, are those of the author and are not necessarily to be attributed to the NRF.

CONTENTS

LIST OF ACRONYMS

RDP	Reconstruction and Development Program (RDP)
SES	Social Ecological System
ERC	Enkanini Research Center
NOAA	National Oceanic Atmospheric Association
TDR	Transdisciplinary Research Method
TRECCAfrica	Transdisciplinary Training for Resource Efficiency and Climate Change Adaptation in Africa
TSAMA Hub	Transdisciplinary Sustainability Analysis Modelling Assessment Hub

GLOSSARY OF TERMS

Adobe Photoshop:	An application for editing digital photographs.
Boundary Object:	An object such as a library accessible to many people from diverse backgrounds. A boundary object is both common and used in different ways. In this way it is tool for building knowledge about diverse social groups.
Climate change shocks:	Weather events that are extreme such as droughts, hurricanes and floods and disrupt humans to the point of extreme disruption or shock.
Commons:	The public space in cities and rural areas that belongs to the people of a nation and that anyone can use.
Co-research:	In the Transdisciplinary method of producing knowledge with society, an actors role in knowledge production with science is called co-research.
Design:	The process of rethinking something and producing a material object or identity that reflects a reconfigured meaning.
Design Thinking:	A way of thinking used in a rethinking or design process that involves collecting information, establishing scenarios and following an iterative process until solutions meet goals and scenarios. An iterative method allows for the development of ideas often in unexpected ways.
Ecosystem services:	Natural resources such as water from a river.
Elicit:	To draw out. The term is used for example in photo elicitation research methods, where an informant is shown photographs to elicit information that may not emerge during structured or unstructured interviews.
Emergence:	An unexpected outcome, that comes about often because of the relationship of several diverse influences.
Empathy:	An understanding of the humaness of another human.
Expert	One with more knowledge than others,
Grey literature:	Literature in the public realm such as newspapers.
Iterative:	A way of developing a thought or design for example. Iterative design is based on collecting information and playing out scenarios. These are then exposed for feedback which then reveals where more information is needed and what assumptions are weak. In design, the term ‘back to the drawing board’ describes an iterative approach. ‘Back to the drawing board’ does not mean returning to the beginning because new information has been collected through feedback. Graphic design is usually undertaken in three iterative stages.

Novel:	An unusual and unexpected outcome.
Resilience:	The original term resilience comes from Holling's (1973: 1) definition of how ecosystems reorganize to adapt and persist despite consistent change. After Holling (1973), resilience is the ability of a system to adapt in response to unpredictable disruption.
Scenarios:	Imagined outcomes.
Sink:	A term for disposing of waste in natural areas. For example, the river is a sink for waste. Contributing factors to resource depletion are both the unsustainable extraction of resources and the sinking of waste. An example of sinking is urban or agricultural water borne waste and pollution that runs off into rivers and wetlands, contributing to ecological shock. In this way ecology is used as a sink for waste. Often the source and sink are interlinked, for example, in flushing systems that use fresh water to remove waste but are not efficient or fully capacitated and thus use a source of fresh water as a sink for waste.
Social-ecological system:	An interrelated set of relationships between society and ecosystems.
Splintered urbanism:	Unequal development in cities
System:	A set of relationships within a boundary.
Transformation:	A state of behaviour change.
Wayfaring:	Meandering.
Wicked problems:	A problem that is seemingly unsolvable because it is unsolved.

A NOTE ABOUT IMAGES

The images included in this document are intended as texts, to be interpreted with the same weight of meaning as the text. A photograph, as Sontag (1977) wrote, enhances the description of things, allowing ‘a kind of possession’ (Sontag, 1977:17–18). An image is a gathering up of information (Pink, 2007b:249). Photographs provide a material sensory experience of information, and in this way the experience of reading knowledge from a photograph is an embodied one. This, following Pink (2007), leads to an empathetic understanding of a subject (Pink, 2007b:250).

Indeed, the way each person understands the world is subjective. Photographs allow for subjective understandings and multiple meanings to be projected upon them. I have presented two sets of photographs in this thesis. They alternate between the text. I have done this, to create an alternating texture, between texts and image, to allow for a conversation between the two. This juxtaposition does not follow a sequence, nor does it relate to the texts in the corresponding pages. The ad hoc nature of this approach is to create a tension between meaning and complexity. In other words, the nature of images subjective interpretation and the ad hoc juxtaposition shall allow the reader to build an emergent understanding of the subject discussed in the thesis.,

The figures in this document are in three distinct groups. Firstly, figure 1 is included in the text. Figures 2:1 to 2:32 are photographs from my own visual survey method of research. Finally, Figures 3.1-3.27 are informant photographs made in a participatory photography workshop, in Enkanini in 2014. This participatory process as a research method is described in Chapter Three, Article Two.

Figures 2:1 to 2:32 are made by electronically stitching together several images to make a single composite. To do this I used Adobe Photoshop software. In some cases the composites are inconsistent representations of reality. For example, a person’s upper body has been cut off. Although these are accidents, I have intentionally left these outcomes as they were created in Photoshop, in some cases, to retain anonymity of the person photographed, in other cases, the justification is creative licence..

LIST OF FIGURES

source: Sustainable Water Fund / Stellenbosch (NL Agency Ministry of Foreign Affairs, 2012). Additional information added by, the author. 45

Figure 2: 1 Cell C. at Stellenbosch Municipal landfill was re-opened 2013. It has a lifespan of three years after which household waste will be transported to a location outside the municipal boundary at an estimated cost of R1 million Rand a month. Photograph: the author 2013.

Figure 2:2. Confluence of the Plankenbrug and Kromme River in Stellenbosch. Photograph: the author 2013.

Figure 2:3. Sign warning of dangerous water quality in the river at De Zalze Wine Estate, Stellenbosch. Photograph: the author 2013.

Figure 2:5. Blaauwklippen River also called Blouklip, at Moordenaarskloof, Kleinnood Wine Estate, Stellenbosch. Photograph: the author 2013.

Figure 2:7. The view from the disused Stellenbosch landfill looking out over the Eerste River Valley with the Stellenbosch Municipal waste water treatment plant in the foreground. Photograph: the author 2013.

Figure 2:9. Runoff from a leaking water main runs downhill in a street gutter in the town of Stellenbosch. Photograph: the author 2013.

Figure 2:11. One of two seasonal runoff streams in Enkanini Informal Settlement, Stellenbosch. Photograph: the author 2013.

Figure 2:13. Looking towards Stellenbosch Mountain from Mont Marie Wine Estate, Blaauwklippen Road, Stellenbosch. In the foreground, land is scoured from a massive flooding event caused when a pipe carrying Theewaterskloof dam water through the mountain burst. Photograph: the author 2013.

Figure 2:14. Upper Blaauwklippen River, also called Blouklip River, Stellenbosch. Photograph: the author 2013.

Figure 2:15. Forest alongside the Blaauwklippen River on Blaauwklippen Wine Estate, Stellenbosch. Photograph: the author 2013.

Figure 2:17. Unused belt press and shed. Stellenbosch waste water treatment plant used to manufacture 'high grade' compost from the waste product of sewage treatment. Sludge is now trucked to a landfill outside of the municipality. Photograph: the author 2013.

Figure 2:18. The town of Stellenbosch has several channels that divert water from the Jonkershoek River in a lei water system for watering gardens and historically providing energy for mills. Photograph: the author 2013.

Figure 2:19. Washing clothes in Enkanini. Photograph: the author 2013.

Figure 2:21. Runoff from Kayamandi and Enkanini 2103. Photograph: the author 2013.

Figure 2:22. Graffiti alongside the Blaauwklippen River, near Kreefgat informal settlement, Jamestown. Photograph: the author 2013. Figure 2:23. A view of Stellenbosch from the Enkanini Research Centre. Photograph: the author 2013.

Figure 2:24. A house made out of plywood displaying public art on Snake Road in Enkanini. Photograph: the author 2014.

Figure 2:25. Side of a house made out of panels that were originally part of a public art project. Photograph:the author 2013.

Figure 2:26. Seepage from municipal landfills is channeled downhill. It runs off into the Veldwachters river. Photograph: the author 2013.

Figure 2:27. A pick up truck with recovered recyclable material from the landfill is weighed at the municipal dump exit. Pickers retrieve plastics from the dump and sell them to a middle man who in turn sells the material. It is the only recycling of plastics at Cell 3, a newly reopened landfill dump with a lifespan of three years. Photograph: the author 2013.

Figure 2:28. A pick up truck with recovered material to be recycled leaves the municipal dump. Photograph: the author 2013.

Figure 2:29. Manholes flood and spill over regularly in Enkanini, partly due to heavy material, such as pieces of cement bags, being flushed down the communal toilts.

Figure 3:10: Indawo yangasese ka wonke-wonke (public toilets). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

Figure 3:11: Idutywa (a place called Edutywa at Knini). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

Figure 3:12: Usapho (family). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

Figure 3:13: Eyona cawa inkulu Enkanini yile (greatest church; Enkanini). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

Figure 3:14: Ubumdaka (dirtiness). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini

Figure 3:15: Umthi (tree). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

Figure 3:16: Ndiypyi yanda (beautiful). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

Figure 3:17: Ulonwabo (happiness). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

Figure 3:18: Imidlalo (plays). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

Figure 3:19: Imdawoyokuphumla (a place to relax). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

Figure 3:20 Indawo zangasese (toilets). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

Figure 3:21: Intaba (mountain). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

Figure 3:22: Esiphaza (shop). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini

Figure 3:23: Izithunzi (shadows). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini

Figure 3:24: Inkuhuhlemdhu (a big house). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini

Figure 3:25: Umama (mother).Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

Figure 3:26: Amatyotyombe (shacks). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

Figure 3:27: Indela (road). Informant Photograph: Participatory Photography Project, Enkanini

Figure 2:1 Cell C. at Stellenbosch Municipal landfill was re-opened 2013. It has a lifespan of three years after which household waste will be transported to a location outside the municipal boundary at an estimated cost of R1 million Rand a month. Photograph: the author 2013.

CHAPTER ONE: RESEARCH DESIGN

Introduction

Ezio Manzini (2015), a leading thinker in social innovation, emphasises that transformation is a social learning process (Manzini, 2015:4). Manzini is a designer thinker[1] that writes about the design process. He argues that society has the potential and capacity to engage in the design of a sustainable future using imagination in both technical and social innovations. In *Design When Everybody Designs* (Manzini 2015) Manzini (2015) emphasises that sustainability is about society's participation, and its diverse creative capabilities. Participation can broaden the potential for innovation and transformation because everybody is a designer (Manzini, 2014a).

In a more political tone, Firoz Kahn (2015) discusses the pressing need for social participation and engagement in sustainability and urges society to re-appropriate the commons[2]. In Kahn's words, the order of the modernistic state is suffering from a global credibility crisis as social, political and financial systems collapse (Kahn, 2015). The slums that characterise African cities are an example of the failure of the modern state (Swilling & Annecke, 2012:114).

African cities house the world's largest populations of urban poor (Parnell & Pieterse, 2014). Slums are also known as informal settlements as they have little to no formal services such as sanitation and waste removal, electricity or running water. These settlements occupy space outside the modern urban grid of city planning and spread over land that is on the margins of cities or in some cases along marginalised land within cities. The Modernist approach of standardised large-scale infrastructure in city planning does not keep up with the extent and speed of the growth of urban populations. African

[1] Design is used in this context, broadly to mean as it does in its original meaning from the French; *to relook* (LaTour 2008).

[2] This definition is from *On the Commons* and describes the commons as resources that belong to the public:

> "Nature such as air, oceans and wildlife as well as shared social creations such as libraries, public spaces, scientific research and creative works (On the Commons, 2015)".

Figure 2:2. Confluence of the Plankenbrug and Kromme River in Stellenbosch. Photograph: the author 2013.

cities exhibit a particular type of urbanism, one with sharp divisions between those that have services and those that do not.

Cities are where an intersection of the collapsing modernistic state, unsustainable development and rapid urbanisation amplify global natural resource crisis. At the same time, cities are where society can engage in the sustainability of the commons.

The town of Stellenbosch in South Africa is an example of a place for sustainability as an urban social movement[3]. Stellenbosch Municipality is South Africa's second oldest municipality. It has seen rapid urbanisation such as the development of farmland into housing, which has led to inefficient service provisions in for example, sanitation services. As I will show in detail in Chapter Two, this perpetuates a crisis of degradation in Stellenbosch's river system.

In Stellenbosch, the main river channel, the Eerste River[4] has a primary use as a conduit or sink for waste. Urbanisation places natural resources under extreme pressure because of the resource demands of urban lifestyles (Girardet, 2004). Climate change shocks such as droughts or floods amplify these pressures (Fountain 2014). As natural resources become degraded, the ability of a region to withstand further climate change shocks is decreased, as is their resilience[5] or the capacity to return to a stable state after a shock (Holling 1973; Vale 2014).

---

[3] In this discussion I use both Stellenbosch Town, and Stellenbosch, to refer to the town of Stellenbosch and Stellenbosch Municipality when referring to the Municipality of Stellenbosch.

[4] Hieronymus Cruse first named the Eerste River (first river) in 1669 on his journey to the interior, as it was the first river that the expedition crossed. Officially the name is a combination of English and Afrikaans, *Eerste River*, which I will use for this discussion (Raper 2004: 85).

[5] Resilience a malleable term. The sustainable development sector widely defines resilience as a system's ability to adapt to change and return to a functioning and stable state. A resilient system is a system that can withstand shocks through reorganization (Hroch 2013; Vale 2013). In other words, it is a system that can; "Absorb disturbance and reorganize, while undergoing change so as to still retain essentially the same function, structure, identity and feedbacks "(Bahadur & Tanner 2014:201; Hroch 2013). Additionally, resilience is measured in how quickly a system can recover after a disturbance and how much disturbance a system can withstand before reconfiguring itself. Thus, resilience is related to stability and vulnerability (Adger 2000: 349). Hollings (1973) concept of resilience is based on complexity thinking and systems thinking. As Du Plessis (2011) clarifies, "Resilience thinking encompasses complexity thinking by collapsing rigid thinking and introducing flexibility, change, multiple scale interrelationships and asymmetry or disequilibrium as accepted characteristics of a system (Du Plessis 2014)".

Figure 2:3. Sign warning of dangerous water quality in the river at De Zalze Wine Estate, Stellenbosch. Photograph: the author 2013.

In light of increasing demand for resources and with the pressures of climate change, the problem of the polluted river in Stellenbosch is a relevant one. It is also a persistent problem. Despite technical mitigations, high pathogen counts of E-coli have been measured in the river over the last eleven years, and solid waste pollutes the waterways (Kloppers, 2014; Barnes, 2012; Infrastructure news, 2013). How then can the capabilities of society be engaged with to care for this shared resource?

The Eerste River

Stellenbosch is a relatively well-resourced municipality in a comparatively well-resourced region. It has a large intellectual capital base in the University and significant wealth in the surrounding and incorporated Winelands. Despite the municipality's tagline as an *Innovation Capital* of South Africa and as *Greenest Municipality* (Stellenbosch Municipality), and the formation of numerous river groups to address the problem of the river, and their creative, intellectual and material resources, the problem persists. Therefore, the problem of the River has become a wicked problem or one without an obvious solution. Contributing to the persistence of the river crisis are complex and ingrained race and economic divisions belonging to Stellenbosch's and South Africa's past and present such as apartheid and rapid urbanisation.

In this study, the River is situated as a lens through which to consider the identity of Stellenbosch. When locating the river as a lens onto Stellenbosch's differences, the river is a collective public place, a 'contact zone' for imagining a place to strengthen local identity, build stewardship or narratives of care and enhance local resilience (Kaden 2012:244–253). Following Pieterse's (2010) argument that to transform the splintered type of urbanism that is evident in African cities such as Stellenbosch, where lack of services for informal settlements is tied to resource harm, the river is a potential instrument for connecting networks and strengthening a sense of place.

A lack of services directly impacts surrounding ecosystems and in South Africa, governing bodies are slow to address the connected social and environmental issues that contribute to the degradation of the shared ecosystems (Firoz, 2015). Firoz (2015) calls government indifferent. Can society cohere in diverse creative and local social forms to care for its commons? In the global south, for example in the case of South Africa, sustainability as a social movement crucially means articulating social, economic, racial and cultural differences.

Figure 2:4. Jonkershoek River at Coetzenburg, Stellenbosch. Photograph: the author 2013.

Research Question

Manzini's (2015) argues that sustainability is a social movement, and Kahn's (2015) proposes society reappropriate the commons (and the implication of which is to care for the commons). Following these two authors, the central question in this research is; how can society participate in caring for the River in Stellenbosch?

Therefore, I examine two proposals in response to this issue. The first as mentioned above is a study of the river as a lens onto Stellenbosch's diversity. At the same time, the river is an instrument with which to imagine the Eerste River watershed. I explain in Chapter Two what a watershed is and how it reveals the interconnections in society and between society and nature. Having established the watershed construct of place, I apply it to Stellenbosch to activate commonality.

The second proposal is that a photograph is a knowledge creation tools that can bridge different social worlds and articulate diversity in a complex shared system. In Chapter Two, I introduce the idea of pictures as boundary objects or objects with both shared and different meanings and in Chapter Three I apply this framework to a case study.

Background to the research

Rivers are connectors, physically and metaphorically, joining upstream actions to downstream consequences (ending in the collective ocean, wetlands, lakes). As such, rivers are critical to the global water cycle and reveal links between the local and the global. In this way, the problem of the River is a lens onto the consequences of unsustainable practices and an opportunity to activate participation in sustainability as a social movement in the care of the commons.

My discovery of the relevance of rivers began in Big Sur California, where I worked as an interpretative designer on a Riparian Restoration Project. Following this was a short stint in Yellowstone National Park in Wyoming as a production assistant on a film about Cutthroat trout[6]. The film crew spent several weeks at high elevations alongside mountain streams. I came to understand more about rivers, particularly their origins as

[6] National Geographic, *Cutthroats of Yellowstone*, June 1997- Oct 1998. Producer, Cinematographer Jeff Hogan

Figure 2:5. Blaauwklippen River also called Blouklip, at Moordenaarskloof, Kleinnood Wine Estate, Stellenbosch. Photograph: the author 2013.

small streams that gather momentum as they flow downhill and broaden out to become sometimes-mighty rivers.

Additionally, I learnt that rivers house a high percentage of invertebrate life. The presence of their incubation sites under rocks reveals the health of a river. With the right combination of water and air temperature, the invertebrates hatch into flying insects and hover above water in swarms often of thousands, mating and laying eggs in the river for the next cycle. These invertebrates are a crucial link in the riparian-based and land-based food web. It is easy to conceive of rivers as the vital veins of the earth once their origins and their significant role as incubators for the food web are understood.

Some years later I did a photographic documentation on the systematic change of a wild river system in Kings County in the Central Valley of California. The Kings River has been re-engineered into a privatized canal irrigation system and as a result, the once biodiverse and unique Tulare Lake that was fed by the Kings River has disappeared. The considerable size of the mega cotton farm seemingly has replaced the large natural lake forever. The large-scale farm is the world's second largest row-crop farm. The Boswell family owns the water of the Kings River that irrigates it[7]. The scale of this water engineering is impressive physically as is the extent of the political weight needed to reappropriate ownership of a vital water runoff system from the Sierra Nevada Mountains to the Central Valley. The lifelessness of the thousands of hectares of chemically managed land illustrates the overwhelming success of humans' ability to re-engineer rivers.

Following this, I produced a book on the interrelationship between rivers, estuarine and ocean health and oyster farming in a region of coastal California[8]. A particular focus of the mainly photographic book was how the conservation of lands, aquaculture farming and culinary lore has cohered in a unique working landscape. The local culture is defined by place and identifies the place and at the same time builds social capital. In

[7] In Mark Arax's *King of California: JG Boswell and the Making of a Secret American Empire.* 2005

[8] 2011, Meyer, G. *Oyster Culture,* Cameron and Company, Petaluma, California

Figure 2:6. Blaauwklippen River also called Blouklip, at De Zalze Wine Estate Golf course. Photograph: the author 2013.

the same region of California, I also designed a media arts (photography and video) curriculum for a US National Oceanic Atmospheric Association (NOAA) funded multi-discipline (arts and science) education project on storytelling and oceans, rivers and watershed health.

More recently as part of this research, I undertook a study in Ethiopia on how society participates in watershed management and what motivates this participation. These findings are in Appendix A of this thesis. Thus, rivers and river systems are of compelling interest and a recurring theme in my photographic work. It makes sense to me now that the Eerste River caught my attention when I began the journey of pursuing a Master's of Philosophy in Sustainable Development,

Relevance

Stellenbosch no longer directly depends on the Eerste River for household water; however, the question of the Eerste River's health is a relevant one. In climate change shocks, the ability of a region to return to balance depends on all parts of the system. One weakness will weaken the whole system. In resilience theory, this phenomenon of an existing weakness undermining the entire system over time is known as a *slow variable* (Ernston, van der Leeuw, Redman, *et al.* 2010).

Aims and objectives of research

The first purpose of this study is to delineate the river ecosystem as a watershed. I set out to examine how a natural system intersects with society and at the same time createscommonality. I describe how the river is a lens onto a diverse town and an instrument to consider the place of Stellenbosch within an ecosystem boundary of a watershed which overrides obdurate social, political boundaries.

The second aim of the study is to examine how to connect diverse networks in the watershed boundary using participatory photography. The objective is to use photographs as a tool to communicate across different social groups. To do this, I use both literature and a case study to situate photography as a tool for building shared knowledge.

The overall goal of the research is to support the argument that the river problem cannot be solved by technical solutions alone. In wicked problems such as the problem of the

Figure 2:7. The view from the disused Stellenbosch landfill looking out over the Eerste River Valley with the Stellenbosch Municipal waste water treatment plant in the foreground. Photograph: the author 2013.

Eerste River, society must be involved in sustainability as a social movement. In the study, I consider the role of tools of imagination and stories for sustainability as a social movement.

In the case study in Chapter Three, I set out to use a participatory photography co-research method to create narratives of place. However, this proved to be much more time-consuming and challenging than anticipated. I encountered difficulty in finding participants. Therefore, to engage with participants in knowledge production I had first to undergo an essential step of joining as a member myself in a different and unknown social network. Although I aimed to bring diverse networks together, I succeeded only in understanding how to engage in one social network.

The storyline in Chapter Three describes how the research aims, objectives and goals became focused. The original proposal goals became simpler and played out in smaller and unexpected ways. The photographs did create narratives of place and did strengthen local identity. However, not in the way I had planned, as I will describe in Chapter Three. A Transdisciplinary[9] learning approach methodology that I will now describe, informs the type of flexibility used in this study. IN the studyquestion structuring and problem framing is influenced by feedback from all stages of knowledge collection.

Methodology

The key to Transdisciplinary methodology is a flexible, iterative process and a participatory approach in several phases of knowledge creation. Transdisciplinary Research methods (TDR) emphasise participation in defining both problems and questions. TDR combines participation in society with multiple academic disciplines and in this way, the public is activated in knowledge creation for scholarship that often addresses social needs (Leavy, 2011). The collaboration between science and society in this participatory method can be called co-design, co-research, co-creation or co-production of knowledge (Hadorn, Hoffmann-Riem, Biber-Klemm, Grossenbacher-

[9] TDR research evolves from post-structuralist, post-modern and post-colonial theories where meta-narrative is deconstructed (Leavy, 2011). The TDR process is a departure from the positivist belief in knowledge as a discovery. According to Denzin & Lincoln (2008:2 in Leavy, 2011) TDR is a deconstruction of the grand discourse of science and its colonization of knowledge. The TDR process of knowledge co-creation is considered more ethical research practice.

Figure 2:8. Plankenbrug River below Kayamandi, Stellenbosch. Photograph: the author 2013.

Mansuy,, Joye, Pohl, Weisamann, Zemp, 2008.. In this research, it is referred to as co-creation, co-research or participation in the co-production of knowledge.

TDR is useful in a study on how society can participate in the care of its river. The theory of TDR provides a frame for carrying out research with the community instead of the more positivist approach of extracting knowledge from society (Leavy, 2011). TDR structures the knowledge building research process in three reflexive stages. This reflexivity is based on feedback and allows for a flexible approach to the research question. The problem structuring of TDR research methods can be dynamic and iterative (Hadorn, Hoffmann-Riem, Biber-Klemm, *et al.* 2008:4)

Participation and iteration are therefore the ingredients for developing TDR's three phases of knowledge creation. These phases are systems knowledge, target knowledge and transformative knowledge. Each stage has distinct methods and goals. Systems knowledge is the initial stage of TDR research and constructs knowledge about a problem, from the actors involved and their interests, rather than from existing knowledge (Hadorn, Hoffmann-Riem, Biber-Klemm, *et al.* 2008). Systems knowledge then leads to framing the problem and developing the questions, skills and resources needed for further research and analysis in targeted knowledge. The final phase is transformative knowledge, where solutions that bring about change are applied. In all these phases, structuring and framing the research can overlap with analysis because of feedback. This overlap can lead back to re-structuring the problem and allows for participation from multiple knowledge sources. In this way, TDR is a participatory and iterative process (Hadorn, Hoffmann-Riem, Biber-Klemm, *et al.* 2008).

The iterative research process describes a spiral mode of research. The spiral mode of research is different from a linear or circular approach. Setbacks do not return the researcher to the same place the research began. New assumptions and new knowledge are created through feedback and applied in each stage (Leavy, 2011). Leavy (2011) proposes that this produces research that matters. There is, as TDR Leavy (2011:9) writes, a "high level of integration between sets of knowledge or epistemologies". Integration is not only cross disciplinary but also between the researcher and research, the theory and practice and the researcher and participating actors.

Figure 2:9. Runoff from a leaking water main runs downhill in a street gutter in the town of Stellenbosch. Photograph: the author 2013.

TDR as a methodology is relevant to the multifaceted question of sustainability (Blewitt 2008). Sustainability theory has ethical (Hattingh 2001) political and ecological as well as personal participatory dimensions. Its complex nature means flexibly engaging in more than one discipline and more than one social network. A cross-disciplinarily approach is what drives the Transdisciplinary Research Method for creating knowledge.

These aspects of TDR make it an appropriate methodology for this research. However, there were limitations in applying a full TDR method to this research. An important consideration is that TDR methods take time, and this is a constraint of this research. For example, the cross-disciplinary collaboration to build knowledge was limited by time. The study was carried out in a TDR learning space of an ecologically designed research center in the Enkanini informal settlement in Stellenbosch known as the Enkanini Research Centre (ERC). It exposed the study to cross-disciplinary ways of thinking in the concerns of the urban ecology, the river and informality. Despite the exposure to researchers from different disciplines in the ERC, the most consistent cross-disciplinary collaboration in this research was with one colleague from the Department of Visual Arts. Another constraint of time limited the research to the collection of systems knowledge and did not expand or evolve further into the development of target or transformative knowledge. It was not within the scope of this Masters thesis to engage in all three of the knowledge building processes of TDR because of this constraint of time. Therefore, following Andren (2010:10) this abridged TDR method is framed as a transdisciplinary *learning approach.*

Nevertheless, this abbreviated TDR methodology as a transdisciplinary *learning approach* did allow for data collection in participatory processes in a flexible evolving knowledge creation process.

Method

The method of data collection was mixed. It consisted of structured and unstructured interviews, participant observation, a visual photographic survey, a walking enquiry and a participatory photography workshop. A literature search and analysis creates a theoretical frame for the argument for sustainability as a social movement.

Literature review

Figure 2:10. Municipal drinking water treatment plant, at Mont Marie Wine Estate, Paradyskloof, Stellenbosch. Photograph: the author 2013.

In the literature review, I followed ways of thinking about the role of society in sustainability. I selected literature through a keyword search of central themes and by snowballing from key articles. These themes are; participation and design thinking, imagination, place and participatory photography. My literature review was limited to constructing a conceptual theory and was not a systematic or state of the art literature review. I used seminal texts to draw threads from the roots in some cases, for example, Sontag (1977) on photography and Holling (1973) on resilience.

Additionally, I reviewed the local paper, the Eikestadnuus for narratives on the river. The Eikestadnuus is a weekly newspaper published in English and Afrikaans with a readership of sixty-one thousand (Media24 2015). I examined weekly issues in five-year intervals 2004, 2009 and 2014.

Case study.

A case study is a useful model according to Yin (2009), to engage in social groups and shed light on how they function (Yin 2009). TDR encourages the challenge of reflecting on uncertainties using real world experiments, studies (Hadorn, Hoffmann-Riem, Biber-Klemm, et al. 2008:31) and I do so, in this case study.

Structured and unstructured interviews and participant-observer methods.

In the case study of Stellenbosch, I had a total of fifty interactions about the river. Twenty-eight encounters as a participation observer in meetings held over several months by three organising groups including; the Blaauwklippen River Forum, the Integrated Infrastructure Committee, and a river group that requested anonymity[10]. Twenty-two other structured interviews with journalists, scientists and Municipal managers include; the 2013-2014 Municipal solid waste director, Municipal wastewater treatment plant manager, Municipal roads and stormwater manager, Municipal

[10] Although I was invited to attend regular meetings of this group as a researcher, when it came to consent, the meeting conveyor was unwilling to sign ethics to participate in this research, possibly because she is a Ph.D. candidate and is using the data. Therefore, the data from this anonymous group is not included in this research.

Figure 2:11. One of two seasonal runoff streams in Enkanini Informal Settlement, Stellenbosch. Photograph: the author 2013.

engineering service manager and Municipal property manager as well as a Ward Councillor. I also conducted unstructured interviews conducted during walking surveys in the micro-watershed of Blaauwklippen River and the Enkanini informal settlement. Additionally, as a member of the ERC[11], I attended sanitation and incremental upgrading discussions with researchers and co-researchers.

Visual survey

The second method of data collection was a visual survey (Figures 1:1–1:30). Photography is a well-established tool in ethnographic research methods to describe and refine forms of knowledge (Banks 2001). The photograph as a record contains content and communicates knowledge (Lapum, Ruttonsha, Church, Yua, David 2012:101)[12]. The visual survey was part of collecting systems knowledge. It is a record of the river, and some of the social networks and technologies alongside it. These include the informal settlement of Enkanini, the Blaauwklippen area, downtown Stellenbosch and municipal infrastructure. This photographic method of enquiry revealed the socio-spatial systems around the river and built systems knowledge.

What emerged from these methods was a rich description of the social diversity within the watershed. This system's knowledge motivated a participatory photography workshop in Enkanini informal settlement [13].

---

[11] Enkanini is an informal settlement in Stellenbosch where incremental upgrading projects in solar and sanitation are underway by students from the Sustainability Institute and The Transdisciplinary Sustainability Analysis Modelling Assessment Hub (TSAMA Hub).

[12] Photographs are considered evidence (Chaplin, 2005:4). Although this idea is contested in the digital age, this is not the focus of this discussion, which is instead focused on how meaning works in a photograph, rather than the photograph as evidence.

[13] I was initially a participant observer in the social organization of sanitation co-operative. This co-operative was created to install communal low flush toilets to address the issue of lack of sufficient sanitation in Enkanini. Through introductions from the sanitation project, I approached Distell, an established corporation in Stellenbosch, who, through their corporate responsibility office, were interested in and concerned about the problem of the river. Distell is located downstream from Enkanini, on the Plankenbrug river. Their interest was to fund a social and technical intervention in sanitation in Enkanini that would in a small way offset the runoff from informal and ad hoc sanitation methods such as the bucket system, flying toilets or the overflow from overburdened sewage systems. In collaboration with the sanitation project coordinator, the idea was to request funds for 1) a toilet and 2) a social engagement project using a participatory photography workshop to create and share knowledge from Enkanini, and reveal commonality and possibilities for new social assemblages to form

Figure 2:12. Storm water run off channel or in Afrikaans, 'sloot', Techno Park, Stellenbosch. Photograph: the author 2013.

Participatory photo workshop

Images are useful in knowledge co-creation. They reveal what is not visible in other forms of knowledge gathering such as interviews (Banks, 2001). As objects, photographs are flexible enough to communicate across social and culture differences (Singh:14). In this way, photographs function as cognitive communication tools. However, as I have mentioned above, finding participants in Enkanini with which to engage in a knowledge co-creation process, proved difficult.

Walking and conversation

The initial goal of the participatory photography workshops was to use photographs as boundary objects to initiate dialogue between the upstream (Enkanini) and downstream (Distell, Blaauwklippen River group) networks. However, in trying to implement a photography workshop in Enkanini, I ran into communication difficulties and this set the research back. I realised the need for a way of engaging in Enkanini. Thus, I began a weekly walk to the ERC as a method to survey the territory, and a way to become known and to know the place.

Walking led to the fifth method of data collection. At the ERC, I co-conveyed twenty weekly collaborative craft workshops with my research partner, as a method of engaging with residents of Enkanini. I describe this in detail in Chapter Three. In these workshops, women came to crochet. Here simple and ordinary conversations naturally emerged and these established relationships and built a sense of equanimity. During these craft workshops, I conducted unstructured and structured interviews with five regular participants. The participants were all residents of Enkanini (four women and one man), and they responded with interest in participating as co-researchers in a photographic workshop to describe the place and the neighbourhood of Enkanini.

An exhibit as a public visual ethnography.

---

in the care of the river. However, as I will discuss later in Article Two, as the method of engaging within Enkanin was not that easy.

Figure 2:13. Looking towards Stellenbosch Mountain from Mont Marie Wine Estate, Blaauwklippen Road, Stellenbosch. In the foreground, land is scoured from a massive flooding event caused when a pipe carrying Theewaterskloof dam water through the mountain burst. Photograph: the author 2013.

The outcome of the participatory photography workshop was an exhibit that unexpectedly became participatory. I propose in Chapter Three that this is a public visual ethnography. The images activated a public in discussing local identity.

In the participatory photography method in Enkanini, the extent of vulnerability in this informal system became visible. This finding led to the decision not to continue with the research objective of displaying the photographs in a different public sphere to connect networks although this goal could be carried out with more time.

In these methods, I followed a flexible and iterative TDR learning approach. An iterative process of research developed. The focused case study was shaped by how the research methods had to adapt to a real life situation. I trace all of these developments in the case study in Chapter Three.

Delimitations

The literature points to a fundamental need to rethink orthodox approaches to infrastructure such as waste treatment and sewage. Rethinking water use is relevant in Stellenbosch in light of the risks of climate change that amplify the scarcity of water. A technical approach to the question of the river is a practical way to address the problem. However, this study is philosophical in nature and based on non-technical ideas.

The research is a limited study of place, narrative and difference and the ability of society to build resilience through shared identity. The study is by no means a technical one, nor an extensive study on evaluating past and present technological mitigation in the Eerste River, although that would be a valuable study. The technological and institutional responses to the problem of the River have not managed to solve the pollution problem. Therefore, I explore the possibility the river as an instrument for a collective practice of care.

Figure 2:14. Upper Blaauwklippen River, also called Blouklip River, Stellenbosch. Photograph: the author 2013.

CHAPTER TWO: ARTICLE ONE

IMAGINING PLACE

Introduction

In this article, I examine the literature on sustainability as a social movement in the case of the polluted Eerste River in Stellenbosch, South Africa, and the role of society in rethinking its relationship with nature. I first situate the problem of the river against the backdrop of rapid urbanisation and resource depletion in Africa and describe the local problem of Stellenbosch's river as a wicked, persistent and relevant one, which reveals both the splintered nature of the town and the interrelationships between Stellenbosch's social and natural systems. I review the existing technical solutions addressing the problem of the river, and establish the argument that the river is an instrument with which to rethink the place of Stellenbosch as an ecosystem or watershed. I expand on rethinking place in a discussion of imagination, and the mode of rethinking things or the design mode of design thinking (Manzini 2014, 2015). I emphasize the agency of images and words in imagining place.

I activate the watershed concept as a construct for an applied practice of connecting community and link this argument to Latour's (2005) discussion on *Ding Politik*. I then consider the challenges of this idea, which leads to a discussion on diversity. I make the claim that photographs are tools for articulating diversity. To reinforce this argument, I introduce the concept of boundary objects as it applies to photographs and the visual language and consider how a visual narrative can link diverse networks in a watershed.

Graham Harman (Institute of Contemporary Arts 2014) notes; "things are only partially translatable and not everything is interconnected". This article leaves out a great deal of literature on place making and socio-ecological systems amongst others to focus on the themes described above.

Africa in the Anthropocene.

At this point in history, humans are a dominating force in nature (Chakrabarty 2009:206). Indeed, human's domination of planetary systems is one hundred percent successful and as Davis (2010:2) writes, humans have now put evolution on a new path. Climate

Figure 2:15. Forest alongside the Blaauwklippen River on Blaauwklippen Wine Estate, Stellenbosch. Photograph: the author 2013.

change urbanisation and biodiversity loss characterise a new planetary epoch called the Anthropocene (Davis 2010:1). In the Anthropocene, human-induced global change has led to the resources on which society is reliant reaching clear limits (Chakrabarty, 2009:200). In South Africa for example, where water is scarce, rapid urban population growth increases the burden on fresh water for household use and flushing waste. With the current drought (2015/2016) the limits of fresh water are visible.

Africa is experiencing rapid urban growth, and its urban population is expected to outgrow Europe and Latin America (UN-Habitat, 2012:29). Part of this urbanisation trend is the expansion of slums or informal settlements[14]. By the year 2025, the majority of urban Africa will be living in informal settlements (Buckley & Kallergis, 2014:177; Parnell & Pieterse, 2014:4). Globally, informal settlements house one-sixth of the world's populations (Satterthwaite, 2007), however, the extent of informality coupled with poverty is unique to African cities. In sub-Saharan Africa, 62% of the urban population live in informality (Buckley & Kallergis, 2014:177).

Swilling and Annecke (2012:123) describe the type of development that separates the urban environment into those who can pay for services and those who cannot as splintered urbanism. Its opposite is inclusive urbanism. An example of splintered urbanism is visible in the South African town of Stellenbosch where 16% of the population live in sub service informal housing (Tavener-Smith, 2012). Stellenbosch has sustained steady growth in population and the built environment in the last fourteen years[15]. According to the 2011 Census, 19.5% of the population still have no access to piped water (this includes communal taps or private taps in the home); 12.9% have no access to toilets connected to sewage infrastructure and 13% have no formal refuse removal services (Statistics South Africa, 2015).

When informal urbanism does not have access to formal services such as sanitation services, waste is disposed of by ad hoc methods and runs off from the land, eventually

[14] A slum is a human settlement without improved water or sanitation, a lack of durable housing and with three or more people living in one room (UN-Habitat, 2012).

[15] According to a 2001 census and 2007 community survey, between those years the population grew from 118 7000 residents to 200 500, a rate of 9.2% (Thomas, 2012: 87). The student body and residents in informal housing influence the growth rate. This is reflected in the 2011 census where the Stellenbosch population is counted as 155 733 with a growth rate of 2.71% (Statistics South Africa, 2015).

Figure 2:16. Security fences on a bridge crossing the Blaauwklippen River on De Zalze Estate, Stellenbosch. Photograph: the author 2013.

ending up in waterways, degrading fragile natural river systems (Tavener-Smith, 2012; Satterthwaite, 2007). This urbanisation trend and the splintered urbanism that characterise it will add pressure to resources in African cities, and threatens ecosystems such as rivers that provide fresh water.

Despite the promise of leapfrogging for sustainable futures that avoid the mistakes of the global North, rapid development in African cities is based on resource depletion. Leapfrogging is technological fast-forwarding seen in the example of the adoption of mobile phone use in Africa (Socolow, 2005). African consumers quickly adopted the newer mobile technology, leapfrogging the need for landline infrastructure (Davis, 2010). In another application of the term, Socolow (2005:4) argues that new carbon-responsive technology could develop rapidly in Africa, leapfrogging old technologies and protecting resources, driven by the potentially prohibitive cost of globally imposed carbon emission taxes. In some cases in Africa, this is the case.

African cities unique scale and type of urbanism poses challenges that cannot be only solved by technical solutions. In splintered urbanism, inter-linked issues such as sanitation, water shortages and water degradation present complex challenges embedded in social inequality and social divisions.

”We belong to where we’re going”.

RAC (musician)

Framing the problem

As discussed above, when sanitation services depend on purchasing power, the wealthy receive services, and the urban poor do not. Ad hoc waste disposal then contributes to resource degradation. In Stellenbosch, the Eerste River is arguably a collection point for the consequences of rapid development, insufficient services as well as failing and old orthodox infrastructure.

The problem of the polluted Eerste River is a wicked problem because to date there is no set of solutions, technical or social that solves it. It is a persistent and relevant problem, as I will describe below. On the other hand, the river problem acts as a constructive lens onto Stellenbosch. As the river winds its way through Stellenbosch’s

Figure 2:17. Unused belt press and shed. Stellenbosch waste water treatment plant used to manufacture 'high grade' compost from the waste product of sewage treatment. Sludge is now trucked to a landfill outside of the municipality. Photograph: the author 2013.

various communities it is a signifier of the whole diverse social and technical (and splintered) urban system and ties the place metaphorically and physically together.

The river is a lens.

The shared river has different meanings for the different groups alongside it. To the wealthy, it is an object of beauty for recreation. For the waste system (managers), it is a natural infrastructure for channelling waste out of the municipal system and for sinking waste. For the informal settlement residents it is a place where vulnerable people live[16]; for farmers downstream it is a vital input for production and for graffiti artists the bridges spanning the rivers provide a hidden gallery. These are some ways the river as a lens reveals the diversity of the place of Stellenbosch.

The health of the river reveals the consequences of the collective social behaviour alongside it. It is thus a means of making society and its relationship with natural systems visible. Aldous Leopold (s.a.) philosophically writes of how rivers reflect the relationships of a place; ”The way we treat our rivers reflects the way we treat each other” (Leopold s.a.). Thus, the Eerste River is a lens onto the interrelationships of Stellenbosch contained within the Eerste River Valley. The river is common to the whole system and defines the system as a watershed (as I argue below). It reveals the strengths, differences and weakness of the relationship between society and nature surrounding it (Koskinen, 2005).

The problem of the river.

The Eerste River’s strength is that it is a rare undammed, free-flowing river [17]. However 80% of the river’s summer volume is made up of urban runoff (Barnes, 2012; City of Cape Town, 2005). Contributing to this runoff is agricultural pollution and household waste water such as watering lawns (Barnes, 2012; Infrastructure news, 2013).

---

[16] In Enkanini, as I will explain in detail in Chapter Four, unmarried mothers live in the area immediately alongside the river.

[17] In South Africa, only 35% of its “mainstream” rivers are healthy (CSIR, 2012). In light of this, priority areas have been identified for conservation (CSIR, 2012). These priority areas are known as National Freshwater Ecosystem Priority Areas (NFEPA) but only address 22% of the South African rivers at risk (CSIR, 2012), which leaves 78% of South Africa’s main rivers at risk.

Figure 2:18. The town of Stellenbosch has several channels that divert water from the Jonkershoek River in a lei water system for watering gardens and historically providing energy for mills. Photograph: the author 2013.

Additionally, insufficient sanitation systems in the informal settlement of Enkanini and Kayamandi result in overflows of grey and black water, which contributes to urban runoff. This polluted runoff affects downstream development enclaves and businesses alongside the river including the corporate offices of some of South Africa's powerful industries and businesses. This polluted runoff weakens the river's health and resilience.

In winter, the river receives further pollution in wastewater overflow when storm water enters the sewage drains, and the volumes of water are too high for the sewage waste system infrastructure to contain (Barnes, 2012). In 2013 for example, on heavy rain events, 40% of the daily waterborne waste was diverted away from treatment directly into the river (Kloppers, 2014). Such inputs of untreated sewage into waterways introduce dangerous pathogens such as e-coil. E-coli is commonly monitored and measured in the Eerste River, but testing for other pathogens such as viral pathogens is rare because of the high cost of lab tests (Barnes, 2015). All pathogens run downstream and affect food growing areas irrigated with river water, threaten wildlife such as birds and pose a risk to people who live alongside and may use the river (Infrastructure News, 2013; Kirsten, 2013).

A persistent problem

The problem of the river is a persistent one. The Eikestadnuus reports evidence of persistent pollution in the river over the last eleven years. Dr Jo Barnes (2015), a senior lecturer in Community Health at Stellenbosch University, identified pathogens in the Plankenbrug River as early as 1998 (Barnes, 2015). The Department of Water Affairs has been in the process of suing the Stellenbosch municipality for releasing wastewater and effluent into the river (Infrastructure News 2013).

A relevant problem

The Eerste River pollution is a relevant problem for Stellenbosch. Agriculture accounts for twenty percent of Stellenbosch Municipalities economy. Agricultural activity such as winemaking adds additional value to the area through tourism and increases the percentage to approximately thirty. As part of the national economy in 2006, Stellenbosch agriculture contributed 27% of viticulture, 29% of dried fruit and 17% of table grapes to South African exports (Haysom & Metelerkamp, 2012:194).

Figure 2:19. Washing clothes in Enkanini. Photograph: the author 2013.

Agriculture in the Eerste River Valley depends both on the Kleinplaas storage dam and the water from the Eerste River. The Kleinplaas is part of the Riviersonderend Berg River Valley inter-basin water transfer scheme. It supplies the Cape Town Metropolitan area and the four agricultural regions of Riviersonderend, Overberg, Berg River and Eerste River Valley in Stellenbosch. Theewaterskloofdam is the collection and holding point for runoff in this mega-scale basin system. The use of water from the Theewaterskloofdam at any other time of year is an expensive prospect for the municipality (Eikestadnuus, January 10 2004: 22).

Stellenbosch is not dependent on the Eerste River for its drinking water. Drinking water for Stellenbosch comes from the Jonkershoek valley to the Ida's Valley Reservoir. In the dry summer months, from November to March, water is pumped from Theewaterskloofdam to both the Kleinplaas Dam and the Paradyskloof purification works in Stellenbosch for domestic water needs.

However, the polluted water quality is a relevant problem for Stellenbosch's household water needs as the health of the river may play a role in household or drinking water supply in the future. As fresh water becomes increasingly valuable in South Africa's dry environment and with unknown pressure from climate change a proposed climate-change adaptation strategy in the Western Cape for mitigating expected water shortages is river water reuse. Water use from the river will not be feasible considering the current state of the water quality (Barnes, 2012; Sebitosi, 2012).

In sum, the problem of the river is a wicked, persistent and a relevant one. The polluted river poses long-term risks to general public health and agriculture. The problem has added relevance in light of the pressures of climate change.

Technical Solutions

In a review of a history of plans to clean up the river, what is evident is that the majority of solutions implemented are technical projects with the goal of mitigating pollutants (NL Agency Ministry of Foreign Affairs, 2012:17). In the Sustainable Water Fund Project Plan, the Netherland's Agency, Ministry of Foreign Affairs reported to the Stellenbosch Municipality that historically the institutional response to the problem of the river includes bioremediation technology to treat runoff from informal settlements (NL Agency, Ministry of Foreign Affairs, 2012). In addition to ecologically designed mitigation techniques,

Figure 2:20. Drinking water fountain on Stellenbosch University Campus. Photograph: the author 2013.

orthodox technological solutions include the expansion of the wastewater treatment infrastructure. Since 2012, the Adopt-A-River program rehabilitates riparian environments using low-income labour in river clean up and trash collection (Bowers, 2013). Tree planting projects along the river prevent erosion and also provide jobs. Additionally, various river coalition groups and institutional planning groups bring parts of Stellenbosch society together to address the issues of the river.

It is evident in the literature and in data collected in the participant observation method of this research, that responsibility for the problem of the Eerste River also lies with society and its systems and patterns of use (Robinson, 2012; Infrastructure News, 2013; Barnes, 2012; City of Cape Town, 2005; CSIR, 2012). Yet, in the persistence of the problem of the river there is no social assemblage that has successfully united to address the problem of the river.

Research question

The problem of the river raises the question how can an African society such as Stellenbosch, participate in sustainability and care for its common local resource of the river? The local scale is of importance in the Anthropocene because of the link of local ecosystems to global ecosystems.

The problem of the river is a local problem. However because the river flows into the ocean, this local problem contributes to the global problem of resource degradation, following a worldwide trend of using the ocean as a sink for waste. Additionally, global and the local economies interlink in cities and an urban water resource affects both local and global economies (Soja, 2011).

The persistent problem of the Eerste River reveals the complex nature of an urban ecology of society and ecosystems, a set of the interrelationship between nature and society, local and global (Ernston & Sorlin, 2009:1463). The river is an instrument for new ways of thinking about the urban as a place (Leach, 2002:287). The Urban is a place of opportunity for new scenarios for sustainability on a local scale linked to the global scale as described above. Another way of asking how can a community care for its river is to ask; what are the possibilities for sustainability as a situated collective practice, that can cohere in a narrative of care (Blok, 2013 in Latour, 2005)?

Figure 2:21. Runoff from Kayamandi and Enkanini 2103. Photograph: the author 2013.

Overview

What follows in section one of this paper is a description about sustainability as a social movement. Section two of the discussion proposes activating societies imagination in re-imagining place as an ecosystem boundary defines it. Section three is a discussion of challenges to this approach above and finally, in section four there is a discussion on photography as tool for imagining place and linking diverse social networks.

Section one: Sustainability as a social movement

The Brundtland definition of sustainability.

At the heart of the question of what is sustainability is arguably the question of how society uses nature. Literature argues that sustainability theory must frame a structural change in this relationship (Du Plessis, 2014:8). The principles of ecological design propose that nature and culture work together. Reconsidering the relationship between society and nature is, Du Plessis (2011:8) writes, where a paradigmatic shift lies. Van Der Ryn and Cowan (1996) conceptualize this relationship as a weave and Alexander (1979), a common language built through patterns of how we use ecosystems (Alexander, 1979; Van Der Ryn & Cowan 1996).

The question of rethinking the relationship between humans and nature, society and ecosystems, was first posed in the Brundtland report in 1987. The motivation for Brundtland (1987) was to develop strategies for ecological, equitable, sustainable growth. Brundtland led the World Commission on Environment and Development (WCED) to set out principles and open a discussion (Brundtland, 1987:291). The report titled Our Common Future (Brundtland, 1987:15) defines sustainable development as: “a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations”.

As is well known, *Our Common Future* brought opposing voices to the table on the subject of sustainable development, yet it did not build consensus on how to go about a process of change (Sneddon, Howarth & Norgaard, 2007). *Our Common Future* (1987) may have highlighted the way the world thinks about the relationship between society, ecology, and equality but the idea of sustainability remains a contested one, and one

Figure 2:22. Graffiti alongside the Blaauwklippen River, near Kreefgat informal settlement, Jamestown. Photograph: the author 2013.

that is easy to manipulate by widely differing agendas and policies (Hopwood & Mellor, 2003:4).

The implication in the definition of sustainability quoted in Bruntland (1987) is that sustainability is an institutionally orientated process and does not include society as an active force of sustainability but rather that sustainability will in some way serve society's needs. Recently authors Swilling and Annecke (2012:53) use a multi-level perspective that analyses institutional change for sustainability as unlikely (Swilling & Annecke, 2012:53). Most institutional interests are locked into deriving wealth from resource extraction and resource-dependent growth, not environmental concerns (Stiglitz, 2002). Institutionally led sustainable development agendas typically serve business interests, which concretize their power through political partnerships in the globalized economy (Davis, 2010; Sachs, 1999).

The text *There is No Alternative; The Future is Self-Organised* reinforces Swilling and Annecke's (2012) argument on the challenge of structural change at the institutional level. Dillemuth, Davies and Jakobsen (2007:378) describe business interests as tied to political partnerships in a form of power that influences the organisation of the state. These state institutional bodies, they argue, now share aims and objectives so closely intertwined with corporate and neoliberal agendas that the social order of the state has been rendered indivisible. Du Plessis (2011:8) points out that old worldviews are reinforced in the triple bottom line language of sustainability, the idea that sustainability is an end goal or aggregate outcome, a trade-off between society, ecosystems and economy.

It is trade-offs, indivisible power and obdurate worldviews that led to hard questions articulated long ago by Sachs (1999:27); in the Brundtland based model, whose needs are being sustained? Du Plessis (2011:7) proposes that the language of Bruntland (1987) limits the process of structural change (Du Plessis, 2011). Other literature calls for structural change of worldviews for transformation (Mang & Reed, 2011; Cole, 2011; Mebratu, 1998:519), which implies a shift away from locked in thinking, driven by outmoded worldviews (Irwin, Kosoff, Tonkinwise, Scupelli, 2015:5).

In sum, the scope of Brundtland's (1987) definition of sustainability is limited. A wider view is that sustainability is a social movement, as I will discuss below leads to the

Figure 2:23. A view of Stellenbosch from the Enkanini Research Centre. Photograph: the author 2013.

questions; what is society and what is sustainability? A discussion on how society might engage in a design mode follows, and I consider the tools of imagination for building resilience.

What is Society?

The discussion of sustainability as a social movement first necessitates using literature to define the idea of social. Latour's actor-network theory (ANT) is helpful as it sheds light on the role of relationship in society. Following Latour (2005), there is no one single meaning to the word social or one single theory of how a social movement might work. Latour's (2005) Actor Network Theory (ANT) describes society as always in relation to something. Therefore social is a changing and reconfiguring assembly of relationships continually formed by context and place (Latour, 2005:4). Latour (2005:9) describes social as; "types of connections with shuffling associations". It follows that sustainability as a social movement is such as set of dynamic inter-relationships (Latour, 2005:9).

What is sustainability?

In his seminal work, Holling (1973) identifies a significant shift in scientific thinking that defines how relationships create resilience. As described earlier, resilience is the ability to return to a stable state after adapting to change (Holling 1973). Holling (1973) proved how systems rely on relationships rather than fixed variables for this adaptation to shock[18]. Further, he found qualitative measures describe relationships better than quantitative methods (Holling, 1973:1). These shifting associations provoke the question; is sustainability a realistic end goal or an imagined optimal state? As Du Plessis (2011:8) proposes, sustainability is no one fixed thing but rather, an emergent outcome of a set of qualities.

[18] Holling (1973: 1) describes two states for seeing the world, the first is as a constant state of equilibrium, the second is a state of constant change and non-equilibrium. In non-equilibrium, attempting to maintain non fluctuation and consistency, he argues, may actually do more harm than good. He found that resilient systems are far from equilibrium.

Figure 2:24. A house made out of plywood displaying public art on Snake Road in Enkanini. Photograph: the author 2014.

Sustainability as a social movement.

As I mentioned in the introduction, Manzini (2014) proposes thinking of sustainability as a social movement where everyone is a designer (Manzini, 2014a). Design is used in this context, broadly to mean as it does in its original meaning from the French; to relook or to reconsider (Latour 2008). For Manzini (2015:2) design or relooking at a thing can bring about change and is a widespread capability. Sneddon et al. (2007:264) agree with the role of society in sustainability, in their view, within the notion of citizenship:

A first step towards strengthening sustainable development as a social movement, emphasizes the processes through which social and political changes occur, and these methods hinge crucially on notions of citizenship, participation and democracy (Fischer, 2000) (Sneddon, Howarth & Norgaard, 2007).

Indeed, despite the limitations of the way things are, social construction theory from the 1970's and 1980's argued that if things are socially constructed they can be reconstructed. Simply, the process of changing society can change us, and vice versa, by changing ourselves we can change society (Soufalis, 2009:1). Manzini, Walker and Wylant (2008:9) argue that it is in society that we learn, where we imagine our role in the world and where change processes happen. In light of the scope of the global crisis and the nature of the crisis, society plays a crucial role in rethinking things.

The design mode.

Manzini (2015:2) calls rethinking a design mode, or design thinking, one activated when the ways things are traditionally done no longer work. The design mode combines critical and practical sense and some skill with creativity to imagine what is not there (Manzini, 2015:2). Typically, disruptive shocks or change cause the need to rethink the way things are done. Manzini (2015: 2) argues we are now, urged by crisis, in a constant rethinking or design mode. The design mode works in two ways. The first is in the technical design of objects to solve problems, and the second is the capacity of design to make meaning or sense of things (Manzini, 2014a).

Figure 2:25. Side of a house made out of panels that were originally part of a public art project. Photograph:the author 2013.

Imagination

One of the tools society has at their disposal for making sense of things is imagination. To change, Puleo (2014:569) argues, people use imagination and creativity. In Manzini's (2015:2) design mode, imagination is a valuable tool for rethinking things (Manzini, 2011, 2014a, 2014b, 2015; Manzini, Chisin, M,'Rithaa, et al., 2015; Manzini & Rizzo, 2011; Manzini & Staszowski, 2013; Manzini, Walker & Wylant, 2008). Daniels (2010:183) writes that imagination is a mercurial and liminal space informed by what is known, and also by what is seen as possible, in other words, informed by the past and what is imagined for the future. Ecologists Holling, Gunderson and Ludwig (2002:18) underscore the value of human imagination by reasoning that creativity is why humanity has survived up to this point in time. In their discussion on resilience they theorise: "Part of the answer lies in people's creativity. People's adaptive capabilities have made it possible for humans to persist, create and innovate (Holling, Gunderson & Ludwig, 2002:18)".

However, not everyone can imagine and implement new ideas. Manzini et al. (2008:3) note that imagining different scenarios or as they term it, forward thinking, or design thinking, coupled with the ability to take action is "not so obvious". Thus, because imagination is not an obvious way of being it is also a valued resource and contributes to social capital. Puelo (2014) reinforces the ideas of imagination as social capital in her discussion on art in post-disaster Haiti. She contends that imagination offers a significant way of building social resilience. In Haiti, Puelo (2014) examines how creativity and the arts used in disaster aid (what she terms humanistic activities) are a process to facilitate access to imagination for rebuilding new scenarios (Puleo, 2014:568, 571). In this way, imagination is a type of social capital.

In sum, the social part of sustainability as a social movement is a dynamic assemblage of relationships. Sustainability can be construed as an emergence of imaginative interrelationships in the design mode. A discussion on rethinking things using imagination to build social capital is now applied to the problem of the Eerste River. The river is situated above as a lens onto diversity and in the following pages as an instrument to reveal how imagination, society and relationships intersect in place.

Figure 2:26. Seepage from municipal landfills is channeled downhill. It runs off into the Veldwachters river. Photograph: the author 2013.

Section two: Imagining place

Manzini (2011:101) underscores the value of place for connecting interrelated social networks in a sense of community. In a discussion on self-organized citizen groups, he situates place as defining a sense of community in the following way. He writes:

Specifically, a sense of community-based on shared, common goods; and a production system set up by networks of collaborative partners, both local and global. And despite their diversity, they share a fundamental common characteristic; they all refer to places, that is, to local resources and local communities (Manzini, 2011:101).

Leach (2002) echoes Manzini (2011) when he describes how place and community are linked in the way they are imagined. Leach (2002) writes, “just as communities are imagined, so the spaces of communities, the territories they have claimed as their own are also imagined (Leach, 2002:286)”. Place is important for connections. It is where, Mang and Reed (2011:28) write, ”mutuality is sought between humans and nature”. A sense of place creates connection and ideas of collective identity and relationships (Mang & Reed, 2011:29). Therefore, place is key to the discussion on sustainability as a social movement. The following discussion expands on how society may imagine place.

In Leach’s (2002:287) discussion of place, an individual conceives of belonging by moving through space or performing place. Performing place is a practice according to Leach (2002) that creates belonging in an individual and in the collective community. This collective behaviour gives meaning to the environment or place (Leach, 2002:287). A geographical imagination is activated when actors move through place in this two-way construction of knowledge and identity (Ingold, 2011:148, 152).

Geographical imagination stems from human geography[19], and differs from imaginative geographies. The concept of imaginative geographies belongs to a discussion of who possesses the power to imagine and deploy imaginaries (Daniels, 2010:183 in Siad, 2003). Whereas geographical imagination is an earlier step, one that is a creative, applied practice. Geographical imagination is the social construction of meaning about place (Daniels, 2010).

[19] Human geography includes the theory of making place.

Figure 2:27. A pick up truck with recovered recyclable material from the landfill is weighed at the municipal dump exit. Pickers retrieve plastics from the dump and sell them to a middle man who in turn sells the material. It is the only recycling of plastics at Cell 3, a newly reopened landfill dump with a lifespan of three years. Photograph: the author 2013.

Geographical imagination is practised in the way an actor's sense of place shapes the landscape and how the landscape shapes the actor's story (Lippard, 2011:85). Daniels (2010) clarifies that the landscape is a medium with influence, as much as an actor,'s observation upon it is. Actors learn from the landscape how to look, how to consider it and in turn, this observation creates the imagination of the landscape (Daniels, 2010:185). Leach (2002:289) puts it this way: the environment serves as a screen onto which actors project meaning and also from which actors read meaning.

Visualising value

Both visual and text-based language, are employed in geographical imagination to denote and reinforce the meaning of place (Daniels, 2010:186). Language and visual artefacts inform, activate and reinforce the values of place and serve to construct the way place is imagined, both metaphorically and materially. Examples are maps that represent material geography. On the other hand, real estate advertisements, tourism brochures and conservation narratives use visual tools to construct metaphoric value about place through aesthetics. Ernston and Sorlin (2009) argue that visual artefacts are active with information in the construction of value about place, and when distributed through social arenas, these artefacts reinforce narratives of place. In this way, visual objects are used to ascribe meaning to place by signifying value and that value is spread throughout social networks (Ernston & Sorlin, 2009). This is an applied practice of geographical imagination, and later in the discussion about boundary objects, I will return to this concept.

Essaying in meaning.

Language also contributes to geographical imagination. Tuan (2002:313) writes language has the power to innovate (Tuan, 2002:313). The idea of *languaging* in (Swain 2006:96) or using certain words to describe constructs of place means language does more than name geography[20]. Language applies meaning and embodies new ways of building knowledge about what place is. As Daniels (2010:183) clarifies:

[20] Languaging in comes from Swain (2006: 96) who argues that language and learning are interconnected and we learn visibly by the language we use. Language is thus a cognitive function that builds cognition.

Figure 2:28. A pick up truck with recovered material to be recycled leaves the municipal dump. Photograph: the author 2013.

> New dictionaries of physical science are exploring the “worldviews” of theoretical keywords such as ”environment” and “adaption”, (Keller and Lloyd, 1994 as in Daniels 2010) and new dictionaries of environmental thought are essaying the intersections of nature and culture, material and image (Harrison et al. 2004 in Daniels 2010).

Thus, through essaying in, or in the words used to describe place, an understanding of place is constructed in geographical imagination.

In the problem of the Eerste River, geographical imagination can contribute to the understanding of a shared place through the use of language. The river is the main channel of a larger network called a watershed. The word watershed describes how the river connects the diverse micro-communities of Stellenbosch town to each other. The land that surrounds rivers is related to rivers, and all rivers that flow in the same direction, meeting in a common channel, make up a watershed. Stellenbosch Municipality (Figure 1.2) has two watersheds: the Eerste River watershed and the Berg River watershed. The Eerste River watershed physically describes Stellenbosch town and its immediate surroundings. The word watershed contains the concept of place as complex and interconnected, and the river becomes an instrument for a way of thinking about place. As a watershed, the relationship between society and nature is visible. Therefore, the word watershed is not just a name. The name contains meaning about place and meaning about belonging to place. I will expand on this watershed concept below.

Imagining the Eerste river watershed[21].

The Eerste River Valley delineates the place of Stellenbosch. This river valley contains a connected system of seven principal tributaries namely; the Jongkershoek, Kromme, Plankenbrug, Blaauwklippen, Veldwachters, Bonte and the Kuils[22] (Figure 1). The common confluence of these tributaries is the main channel of the Eerste River, which

[21] The original use of the word watershed is to describe the topographic point that defines a flow direction of water. Watershed however is a term increasingly used, mostly in North America, to describe this common collection of flows into a catchment or basin.

[22] The Kuils River connects to the Eerste River near its mouth at Macassar but is outside the Stellenbosch Municipality. The Kuils River is seasonal and in summer forms pools, which is how it derives its name. Kuils comes from the Dutch, “de kuylen” or "the pools" (Raper, 2004: 191).

Figure 2:29. Manholes flood and spill over regularly in Enkanini, partly due to heavy material, such as pieces of cement bags, being flushed down the communal toilts. Insuffient capacity of the sewage bearing infrastructure is another cause. On the left, municipal workers respond. Photograph: the author 2014.

runs through the Stellenbosch Municipality boundary and out into the ocean in the Cape Town Municipality at Macassar. That all these tributaries mentioned above flow in the same direction articulates and describes the watershed as a river system with multiple flows.

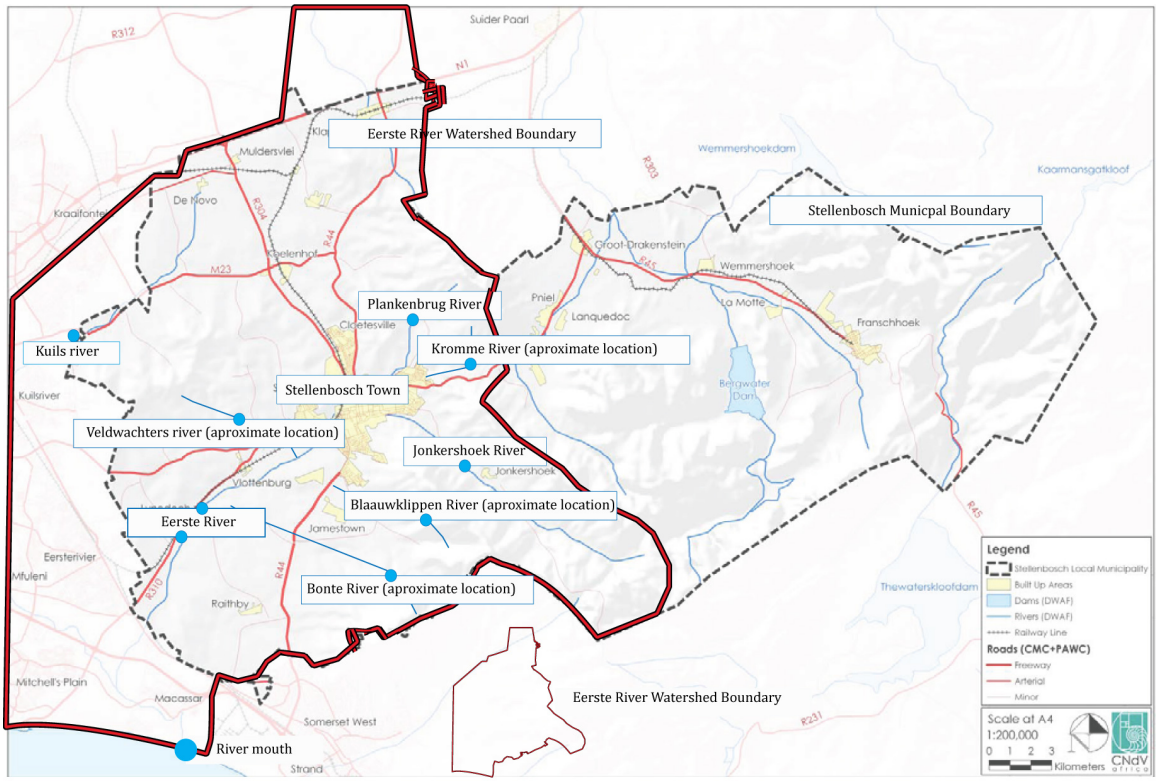

Figure 1: Map showing the Eerste River Watershed in red and the Municipal boundary as a dotted black line. Seven rivers flow into the main Eerste River channel. Base map source: Sustainable Water Fund / Stellenbosch (NL Agency Ministry of Foreign Affairs, 2012). Additional information added by, the author.

As the Eerste River is the main channel for the collection of all these flows, the basin (the Eerste River Valley) described by all these rivers can be called the Eerste River watershed. Watersheds are defined by the common topographic direction of river flow. The main river channel is the lowest point in the surrounding landscape and usually gives the name to the watershed (Speed, Le Quesne, Pegram, et al., 2012; State of California, s.a.; UNEP, 2004; Cohen, 2012; Thieme, Abell, Stiassny, et al., 2005). Within a watershed, all the land or territory that water travels over including land occupied by

Figure 2:30. View from Blaauwklippen Estate to Kreefgat though a high security fence. The Blaauwklippen River is in the middle ground. Photograph: the author 2014.

the built environment. The word watershed evokes an ecological scale of a region with continuous connectors of the local to global systems, made visible by rivers, which link to the surrounding landscape they flow through (Cohen, 2012; UNEP, 2004; Thieme, Abell, Stiassny, et al., 2005).

In Stellenbosch, the term watershed is not commonly used in the public discussion about the river (Eikestadnuus 2004e, 2009, 2004d, 2004c, 2004b, 2004a; IIC 2014; Heritage Committee 2014). The Eerste River is referred to interchangeably as the Stellenbosch River, the Eerste River Valley or the Eersterivier. Adding to a fragmented concept of the river, in the Ekestadnuus, the river crisis initially emerges as a crisis of separate rivers (Eikestadnuus, 2004, 2009, 2014). Throughout the public discourse found in the local paper about the river, the river is not discussed as an interrelated problem within a shared system (Eikestadnuus, 2004, 2009, 2014)[23].

Connection, collection and integration are the physical behaviours and principles described in Integrated Watershed Management Science (IWM) as the approach for technically managing regional water systems (Atkinson-Palombo & Gebremichael, 2012; Chisholm & Woldehanna, 2012; Atwood, 2012; Shuttleworth, 2012). The construct of a watershed is studied in this article for its metaphoric agency of connection and integration. This discussion is limited to the geographic imagination of a watershed and not the management science of IWM. However, it is acknowledged here that to manage place as a watershed requires IWM science. Nevertheless, a watershed as geographic imagination conceptually overrides institutional boundaries and is, therefore, a way of describing place for collective care and concern. All activities in a watershed, undertaken by either formal or informal systems of society, as grand plans or incremental responses, or by insurgent[24] or breakaway groups, are connected and collect in a common nexus of a river.

Place as a *Thing* of public concern.

[23] This is also evident in how the word catchment is used in the geographic imagination of the area. As an example, in maps of the nearby Hottentot Holland Mountain range the word catchment is used to indicate unconnected areas of land. In the wider literature, the term basin, catchment and watershed are used interchangeably to describe a connected system.

[24] An insurgent is a citizens taking action apart from the state (Pieterse, 2008: 125).

Figure 2:31. A view of the Eerste River from a bridge at Spier. Photograph: the author 2014.

In Nordic and Scandinavian cultures, a *Thing* is the word for places where publics[25] are intentionally concerned with and co-create knowledge about collective mutual matters. Today the word is still applied in this way to the Icelandic parliament, which is called *Althingi* (Kharkhordin, 2005:281). *Things*, writes Kharkhordin (2005) are the place for public gatherings for public councils. They were held under trees or in open spaces. Thus, the location of a *Thing* signifies the activity of public concern or *Things*. These places are where people shared their lives and concerns and their histories unfolded. In this way, people become tied together through a tangible place such as a tree (Kharkhordin, 2005:289). Following Heidegger, Kharkhordin (2005:289) highlights a *Thing* as bringing together "mortals, gods, earth and sky". Kharkhordin (2005) writes about *Things* using rich descriptions and historical examples from Novgorod, Rome and Venice and the writings of Cicero[26]. The word *Thing* as applied by Latour (2005) and Kharkhordin (2005) activates the notion of *Res Publica*, or common, as in belonging to all people, concerns and affairs. Kharkhordin (2005:280) quotes Cicero saying tangible *Things* are essential for the maintenance of the Republic because "under the rule of tyrants there is no property of the people, no common wealth, indeed when people rise, they rise to reclaim their property (Cicero in Kharkhordin, 2005)". Kharkhordin (2005:289) asks "whether contemporary republics, particularly those that call themselves representative democracies" have forgone the need to have tangible *Things* or *Res Publica*.

A watershed can be construed as an expanded idea of a *Thing* to which people belong just as the ancient examples of use of *Things* found in Italy and Scandinavia. A watershed is place where people live, a place they can be concerned about, and contains a collection of public's behaviour. It is a place of public concern and as vehicle to be managed it is a place to act out citizenship in the care for the commons. Put another way, it is a place within which to practice sustainability as a social movement.

As a way of imagining place, a watershed works as a conceptual bridge between metaphor and materiality and between environmental science (Ecology) and cultural

[25] Publics is used in the plural following Björgvinsson, Pehn and Hillgren (2012:1). In their words; public is plural because " the governing of public concerns generates multiple terrains that blur distinction between public and private"

[26] Cicero was a philosopher: 107BC to 46BC

Figure 2:32. Crocheted bag, Enkanini 2104. Photograph: the author 2013.

studies (Society) (Daniels, 2010:185). A watershed, as I explain above, gives meaning to place as a connected system of relationships between society and ecosystems as a socio-ecological system. In resilience theory, society is inextricably interrelated with natural systems. This interrelationship is described in literature as a socio-ecological system (SES) (Holling, Gunderson & Ludwig, 2002:5). Holling, Gunderson and Ludwig (2002) introduced the term socio-ecological systems (SES) in their book *Panarchy* (2002). Panarchy is a word to describe the continually reassembling set of relationships and dynamic nature of a socio-ecological system (Holling, Gunderson & Ludwig, 2002).

A watershed construct highlights complex interrelationships in a shared knowledge environment. It reveals local and common relationships (Cohen, 2012; Newman & Paasi, 1998). The public-ness of the space shows the collective behaviour around it. As a Thing or shared public space knowledge about identity, citizenship, and a sense of belonging to a place and a community can be negotiated. Watershed science shows that public space contributes to a community's sense of place. It offers opportunities for connecting diversity and strengthening social capital through collective identity or sharing a common good (State of California s.a.).

In sum, to activate sustainability as a social movement, a watershed concept is a construct for imagining commonality through place. The tools of imagination in a design mode and words and images can be employed to reinforce ideas of reimagining place as a common Thing.

Section three: Diversity

The watershed principle situates the common wealth of the river in relationship to society. It is a material and metaphoric boundary for commonality (Newman & Paasi, 1998:188). However, there are problems with this approach as boundaries of any type activate power relations (Newman & Paasi, 1998). As Cohen (2012) warns, the ecological boundaries of a watershed are socially constructed and not value-neutral (Cohen, 2012:2208). Where there is a we created through boundaries, there is an other (Newman & Paasi 1998). Power is concretized when the we conceives of itself in relation to an other, defined by territorial boundaries (Newman & Paasi 1998:191; Rutherford, 1990:210). Therefore, boundaries that define a place create both commonality and difference.

Figure 3:1: Kuhle (beautiful). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text:generated during exhibit, May 2014, Enkanin

Although humans, notes Tuan (2002:314), have an imperative and cultural push to belong to something, it cannot be assumed that a boundary can establish commonality and common values. Indeed, the very idea of community is a contested one. In the literature, Tuan (2002:307) points out *community* as an ambivalent word. Bhabha (as in Rutherford 1990:216) calls it an Arcadian construct linked to a colonial perspective. Bhabha (1990) proposes that culture is continually forming in relationship to an other, and cultural difference cannot be contained by a universalised idea, or idealized state, such as that reflected in the construct of community[27] (Rutherford, 1990:209).

What is community?

Ostrom (2009:418-419) finds that a group of people will cohere around shared resources if they are dependent on it for livelihood. For example, when a community is dependent on the use of water in agriculture, stewardship practices are undertaken for the benefit of a collective. With dependency, shared care is likely to increase, and the resource can be managed as a commons (Ostrom, 2009). As established earlier, Stellenbosch is not dependent on its river for drinking water. Nevertheless, a community as a construct is where according to Adger (2000:349) social capital and social resilience can be built and therefore measured [28]. However, community and commonality cannot be forced.

Massey (2011) warns of the pretences of inclusive. Exclusion exists she (Massey 2004:7) argues and place holds multiple meanings for multiple groups. Thus, place is a multiplicity. Massey (2011) argues there is a danger of assuming ideas of community will cohere through local and place because, despite the authentic sound of these concepts, the meaning and implication are ‘fuzzy’, and inequalities can be dismissed by a drive for commonality. Massey (2011) points out that to be a collective we must create the space to engage politically with difference and inequality. Political engagement, she underscores, is essential (Massey, 2011) echoing Kahn (2014).

---

[27] In contrast, in the case of Stellenbosch, well-resourced groups refer to the less privileged as community. The use of the word in this way can be taken to imply that a community is limited to those bound together by poverty

[28] Social resilience is measured using proxy indicators of crime, formal employment, migration and other culturally defined variables that build social capital and community.

Figure 3:2: Kuhle (beautiful). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text:generated during exhibit, May 2014, Enkanini.

Diversity

These ideas about commonality defined by an ecosystem boundary now bring the discussion to the topic of articulating diversity. It is not accurate to lump difference, inequality and diversity together. They mean different things. Bhabha (1990) uses the word cultural difference instead of diversity. Diversity he notes, is a concept filled with a sense of museé imaginaire, the imagined idea that cultural difference can be curated in a conquest of colonial appropriation of culture, something to be housed in the construct of an existing grid (Rutherford 1990:209-208). Cultural difference for Bhabha (1990) is linked to cultural articulation. Cultural difference, in the South African context, means racial, economic and cultural difference and often built on inequality both past and present. This discussion applies the word diversity to the general concept of difference in race, economics and culture.

Importantly, in an African urban environment diversity cannot be dismissed by, for example, the enclaves of splintered urbanism. As established earlier diversity it is key for strengthening resilience in complex systems (Ernston, van der Leeuw, Redman, Meffert, Davis, Alfsen & Elmqist, 2010). One of the principles to adopt in the face of uncertainty and risk as Mau et al. (2011:31) put it, is learning to share; “to imagine that one closed group could solve the complex problems we face today is folly”. Ernston et al. (2010:532) comment that “the cross-scale interdependencies of a system mean no single variable can be indefinitely isolated from affecting the system”. To actively engage in articulating diversity, Bhabha (1990) argues, tolerance of difference can only be established on the basis of a non-sovereign notion of self (Bhabha as in Rutherford, 1990:212).

It is not within the scope of the paper to extend this argument about political engagement although failing states and taking care of the commons can be construed as a political act in Latour’s (2005) *Ding Politik* or politics of Things. Suffice it to say that Bhabha (1990) reinforces the argument for defining a sense of shared identity through place, by, as he and Massey (2011) add, articulating diversity.

The final part of the discussion now considers knowledge creation tools as a means to for articulating diversity. I situate photographs as boundary objects in the construction of community. This is against a backdrop of the above discussion on a shared sense of

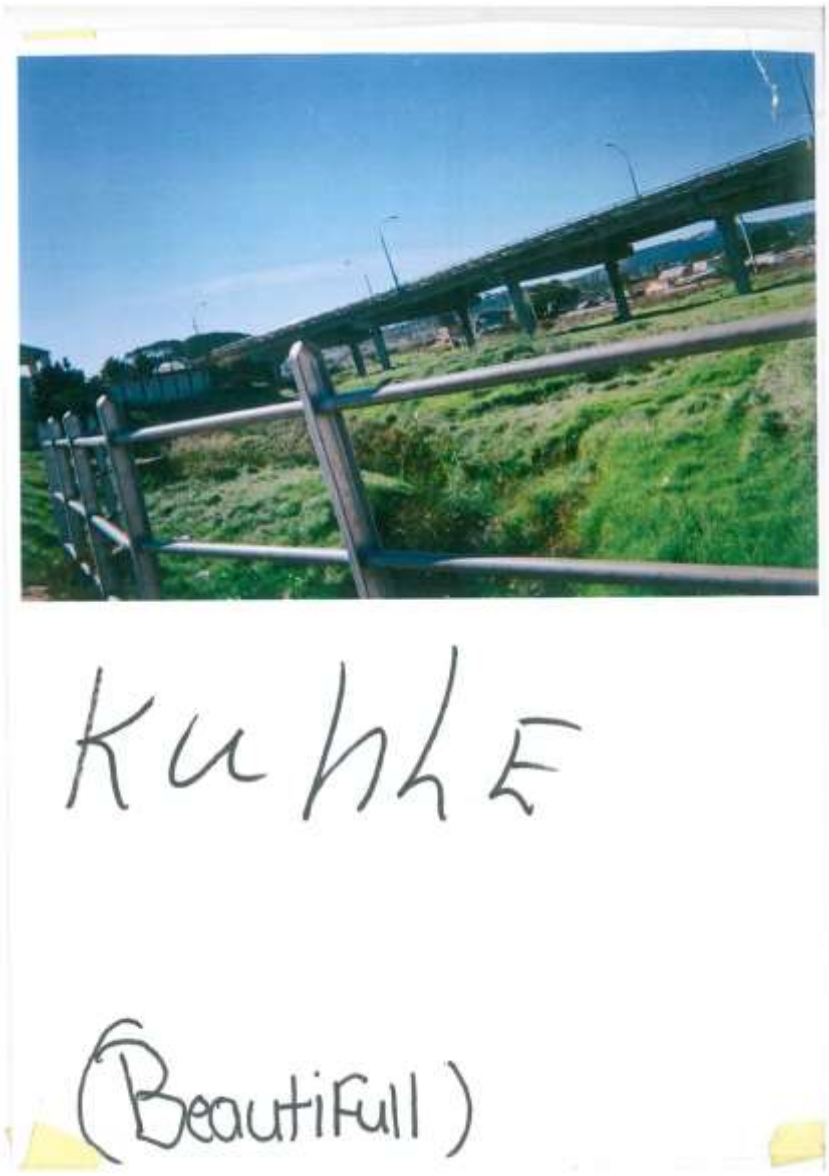

Figure 3:3: Kuhle (beautiful). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text:generated during exhibit, May 2014, Enkanini.

place. Specifically, I describe Greismer and Star's (1989) four types of boundary objects and how they work as objects at the intersection of difference.

Section four: Boundary objects

Community implies amongst other things, connection, care and communication (Tuan 2002:307). Communication is from the Latin to share or to make common and is about shared sense and meaning making (Mendizabal, 2014:33). Humans do not always successfully communicate as they organize, experience and perceive the world in highly diverse ways (Tuan, 2002:308-311).

Boundary objects as knowledge creation tools.

Greismer and Star (1989:387-393) conceive of boundary objects as relevant where actors from diverse backgrounds have to cooperate. In the words of these authors, boundary objects are objects that are flexible, and "plastic enough to adapt to local needs, robust enough to maintain a common identity, weakly structured in common use, strongly structured in individual use" (Greismer & Star, 1989:408).

Greismer and Star (1989:410-411) describe four kinds of boundary objects. These are 1) the repository, for example, a library where use is possible without negotiation (besides a set of rules for example; library card, library hours and certain expected behaviour of care) and this maximizes cooperation. 2) The second is the ideal, an abstracted concept with multiple members such as classification, for example, species. 3) Coincidental boundaries are the third type. These are objects used for common reference such as maps[29]. 4) Fourthly, standardized boundary object such as, as the name suggests, a standardized form. All these types of objects have multiple and diverse users. In this way, a boundary object is a common way of communicating across diverse groups but used in different ways by different groups (Greismer & Star, 1989:411). Objects which are shared or understood by many, are tools to negotiate meaning and build knowledge (Singh, 2011:9). Also referred to as common information

[29] Maps can be hand drawn or drawn by a GIS expert; but they can both be read as maps, despite the different levels of skill and knowledge input. Maps can be hand drawn or drawn by a GIS expert; but they can both be read as maps, despite the different levels of skill and knowledge input.

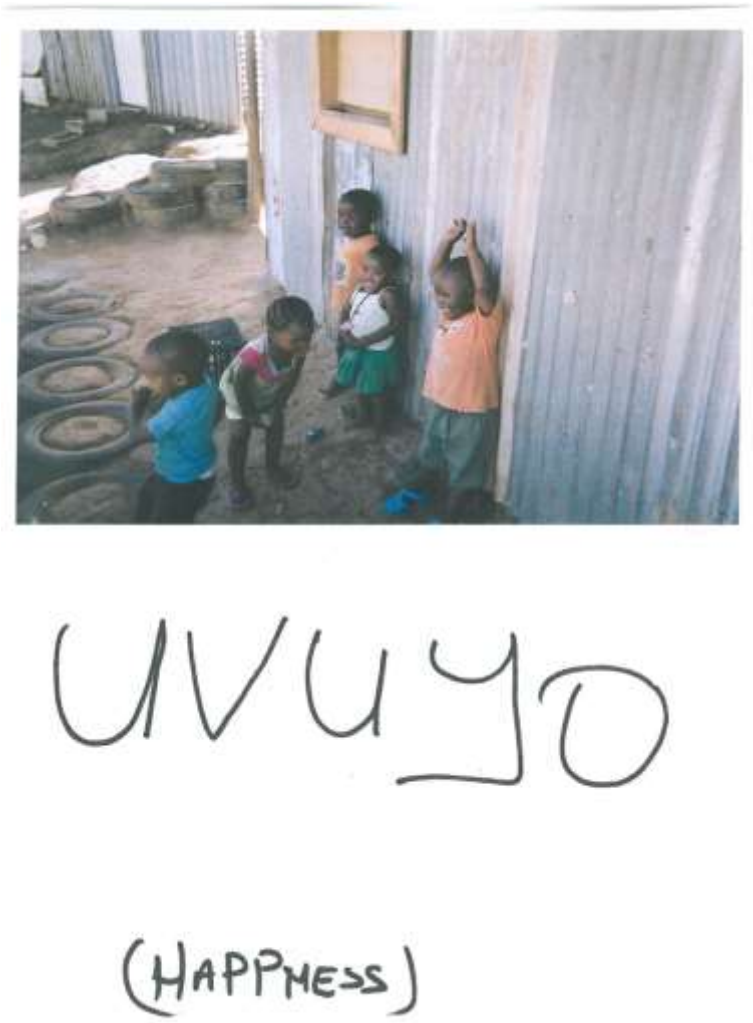

Figure 3:4: Uvuyo (happiness). Informant Photograph:Participatory Photography Project, Enkanini 2014. Informant Text :generated during exhibit, May 2014, Enkanini.

spaces, boundary objects are objects around which communities of practice[30] can cohere (Denham, 2008). Becker (2012) points out that boundary objects are necessary for complex and diverse networks which require cooperation, and collaboration to create knowledge (Becker, 2012) because boundary objects can move between different social worlds (Greismer & Star, 1989:393).

As Elzinga (208:350) writes, a common language has to be developed between culturally different participants by establishing a suitable boundary object for commonality. A boundary object in a complex knowledge environment is a bridging concept, one that can articulate difference and weave together coherency. An example is a photograph.

Photographs as boundary objects.

As mentioned earlier, visual artefacts such as maps and photographs are used in the practice of geographic imagination. Visual artefacts can also contribute to describing shared value of place in a narrative of care. For example, photography and film were used to communicate the value of the natural beauty of The Grand Canyon in the United States. This value narrative initially entered the public discourse before the Grand Canyon was protected and the public adopted and spread the ideas in this narrative, furthering the cause for a National Park (Ernston & Sorlin, 2009)[31]. In this way, images as boundary objects can activate a common language in a protective narrative. In the above example, images are classification boundary objects, where value is the classification containing multiple members.

I will now continue to examine how the semiotics of photographs or the visual language enable photographs to work as boundary objects in another example from Ernston & Sorlin (2009). Following this, I close the argument by proposing that photography as a tool for representing place can create artefacts that link diverse networks, articulate

[30] The idea of community of practice implies a collective practice that could involve care, would involve cooperation and clearly would involve communication.

[31] Ernston &Sorlin (2009: 1462) describe how geologist's painters, authors, photographers and preservationists lifted the Grand Canyon from obscurity. The artefacts articulated value which was reinforced by actors in social arenas and resulted in a conservation narrative that protected the canyon in a National Park (US).

Figure 3:5 Ukukhula (growing up). Informant Photograph:Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

differences and build knowledge in the complex environment of the watershed which contributes to a narrative of care for the Eerste River.

How a photograph makes meaning.

Photographs, depending on how and where they are read, build specific meaning in controlled or interpretative ways. The framework of a photograph constructs and provides a mental model of what it depicts (Shore, 2010:97). On the one hand, this can be in the employ of specific messaging such as the example of the Grand Canyon above. Another example where photographs are used to further political or social agendas, is found in how photography was used to message the imaginaries of the British Empire, and in the survey and classification of race, to mobilize and reinforce racial bias (Ryan, 1997:27). On the other hand, a photograph can activate flexible understandings in the way it communicates. Reading photographs is an experienced practice writes Pink (2007:142). They are multivocal or can contain multiple narratives and thus many meanings (Banks, 2001:25). In this way, they evoke meaning in a different way from texts (Chaplin, 2005:34).

Images are embedded with information about society and meaning is dependent on the social context an image is read in (Banks, 2001). Therefore, a photograph is never free of the social, political or cultural context it is made or received in (Pink, 2007a:75). In this way, a photograph is not a copy of reality but a social construct of the world, and there is a tension between realism and relativism in photographic images (Grasssen, 2011:21).

Therefore, the visual language is elastic and a photograph works as a boundary object. Pink (2007) writes of this capacity of photographs, to ‘underscore linkages’ of experience, reality and imagination, difference and commonality (Pink, 2007a: in Stoller, 1997:92). The tension between what a photograph shows and what it means, reveals, as Chaplin (2005) writes, what counts as knowledge is relative to belief (Chaplin, 2005). Nevertheless, as Singh (2011:10) and others have shown, visual artefacts reveal and construct meaning and can be used to create new knowledge between diverse social networks because a photograph can cohere more or less a collective understanding (Chaplin, 2005:11; Singh, 2011:10). The visual narrative, as Galbiati et al. (s.a.:8) point out, triggers a process of shared identification (Galbiati, Bertolotti, Mattana, Piredda, s.a.). In this way, a photograph can elicit the articulation of difference through reading of images.

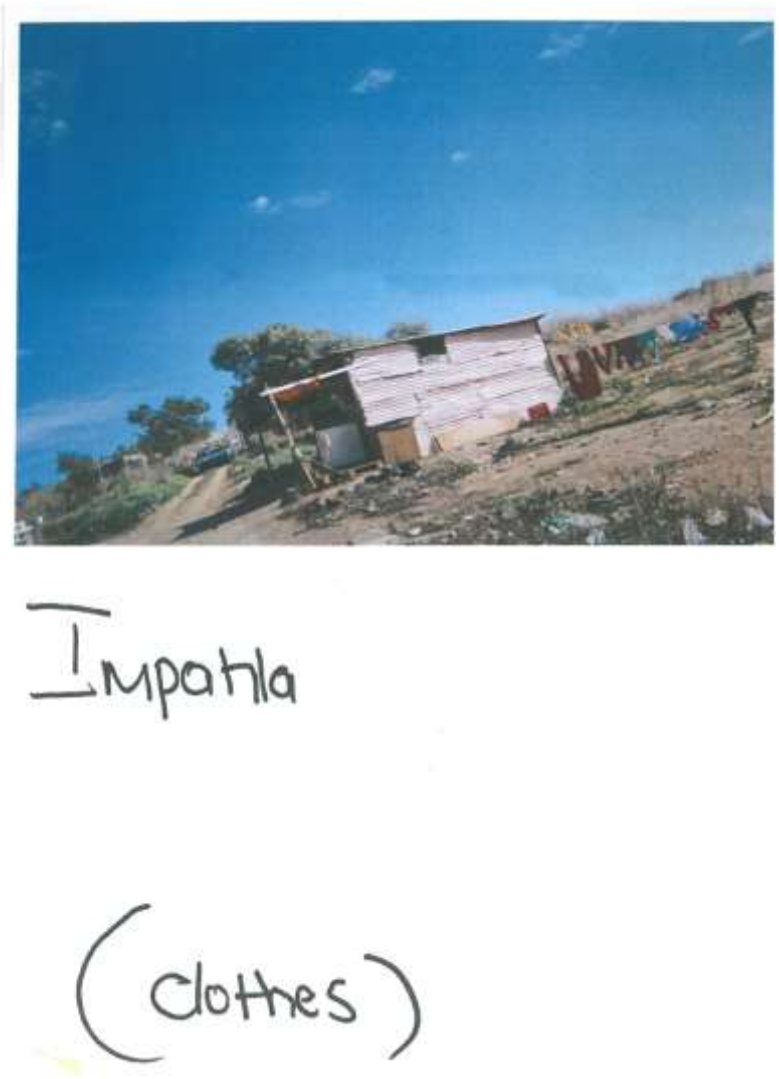

Figure 3:6 :Impahla (clothes). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

Ernston & Sorlin (2009) describe an example of a social movement that succeeds in protecting a brownfield as an urban park using visual artefacts[32]. These authors attribute part of the success of this movement to the use of maps, drawings and photographs, and their dissemination in social arenas. They note that the demographic that typically "weaves the protective narratives of place" is that of the knowledge elite (Ernston & Sorlin, 2009:1463). This is probably due to amongst other things their access to resources for creating aesthetic artefacts and broadcasting them into social arenas. However, increasingly camera phone technology and social media allows a diverse social group to contribute to the meaning of place by publishing narratives of place in the virtual sphere. As Pink & Hjorth (2012) argue, images become part of place or emplaced, and this illustrates the agency of images in embedding meaning in place. The picture becomes part of the social construction of place (Pink & Hjorth, 2012). In the example from Ernston & Sorlin (2009) visual artefacts, as objects are used to construct value narratives about a place that are shared. In this way and Pink and Hjorh's argument, these visual artefacts act as boundary objects (Ernston & Sorlin, 2009:1461-1463).

Conclusion of Article One

In this article, I have used a design thinking framework within which to examine the wicked, persistent and relevant problem of the Eerste River in Stellenbosch. Throughout I have threaded themes of sustainability as a social movement and discussed the capacity of imagination. I argue that the river as a lens reveals the fragmented nature of Stellenbosch. The river is also an instrument to define an ecosystem boundary of a watershed. This construct is a way to imagine place. I examine the idea that the watershed concept reveals relationships of a place and can strengthen local identity and build local resilience. I then consider articulating diversity, as there are multiple narratives about the place of Stellenbosch. I mentioned earlier that the municipality frames it as an innovation capital. The tourism industry promotes Stellenbosch for its Winelands. The Mayoral Heritage Committee frames it as a place of many communities and villages and a resident in Enkanini may frame it as a temporary place of employment with a more permanent home in the Eastern Cape. Therefore, boundary

[32] Stockholm National Urban Park, Sweden

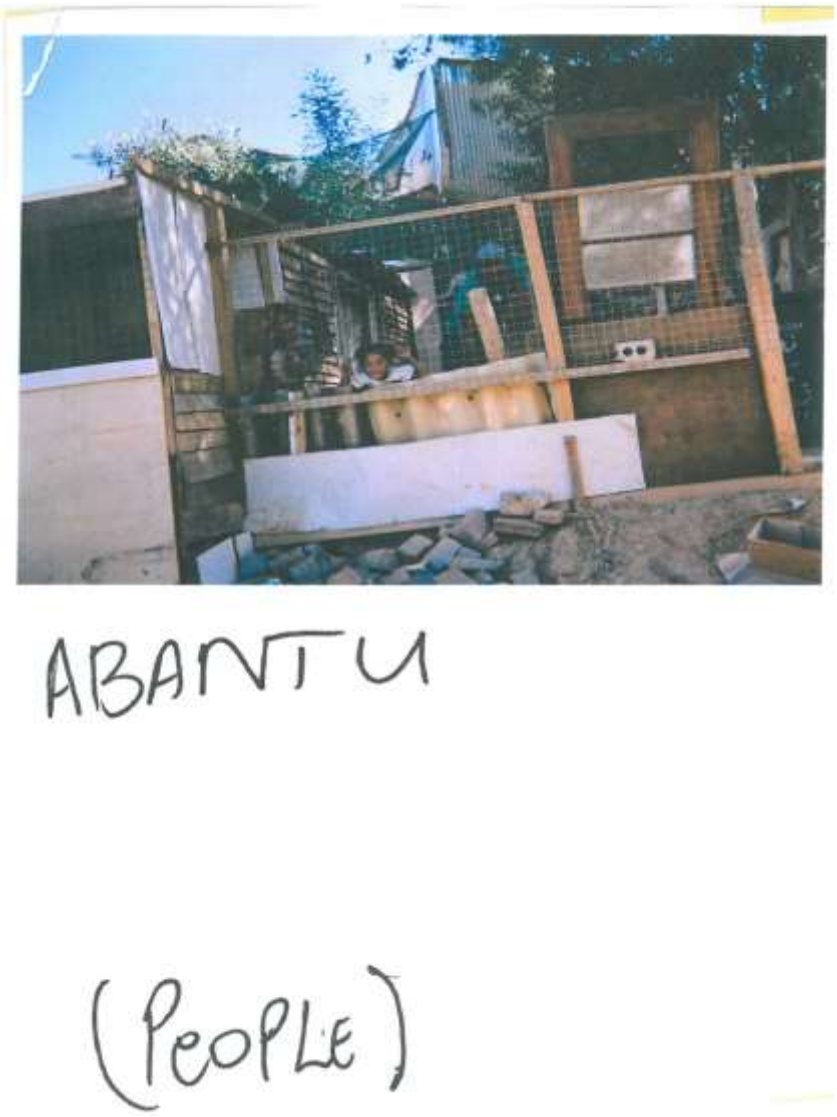

Figure 3:7: Abantu (people). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

objects enter the discussion as tools to connect networks in narratives of care. In Chapter Three, Article Two, I apply this theoretical construct to a participatory photography experiment as a case study. The case study aims to use the visual language in the construct of place and connect diverse social networks in Stellenbosch in a protective narrative. However unexpected outcomes emerged. In Chapter Three, I discuss this process as it reveals the TDR learning approach of this research.

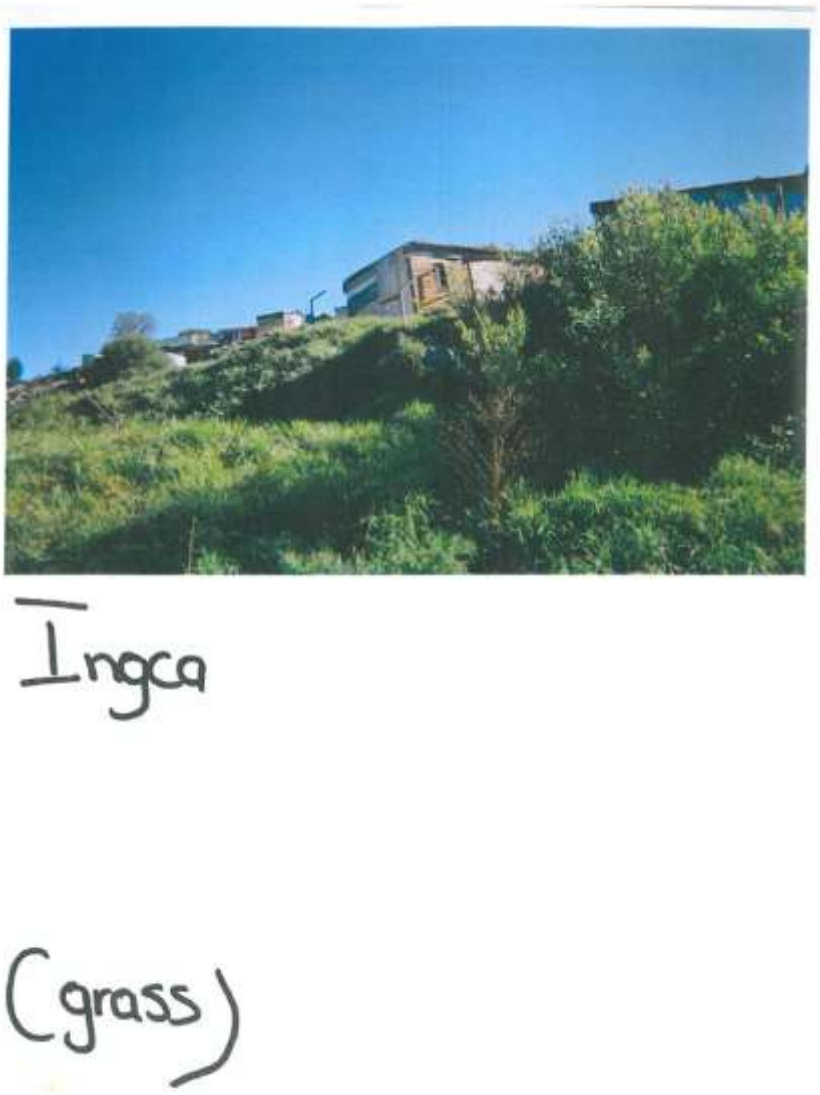

Figure 3:8: Ingca (grass). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

CHAPTER THREE: ARTICLE TWO

CREATING VISUAL NARRATIVES IN A LAYERED APPROACH

[Presented at; Research Uptake Conference, Panel on visual research methods, Nairobi Kenya. February 2015; Visual Research Networks, Last Focus 1st International Conference, Paris France. Poster, November 9th (in absentia).

Introduction

Evident in the ongoing crisis of the Eerste River in Stellenbosch is that it is a wicked problem, one which neither institutional nor non-institutional social assemblages have succeeded in solving. As I have explained in Article One, the problem of the river is relevant in the Anthropocene. In Article One, the river is established as a lens onto splintered urbanism. I position sustainability as a social movement because of the capacity of society to be creative. Place is a core construct for connecting diverse networks in a collective identity for sustainability as a social movement (Pieterse, 2010). The river is an instrument with which to create ideas of place through the concept of a watershed. This construct of place can evoke community, engender care, reinforce local identity and strengthen social capital, a contributing factor to social resilience (Adger, 2000:349).

The objective of this case study was to co-create knowledge about the place of Stellenbosch. In Article One I established that visual narratives contribute to the construct of place. In this Article, I explain how a participatory photography workshop was planned as a case study method to examine place, community and care. However challenges to this proposal arose which meant novel methods of engagement were needed. Therefore central to the following discussion is the question of how to engage (as the researcher as a creative practitioner) in participatory knowledge creation with the most vulnerable parts of the knowledge environment where there are economic, racial and social differences. The process of implementing a participatory photography workshop in real life involved a layered approach in a territory that was foreign to me. By walking, making[33]and listening to conversation, this researcher overcame some barriers to co-create a site-specific photographic narrative of place. When the photographs were

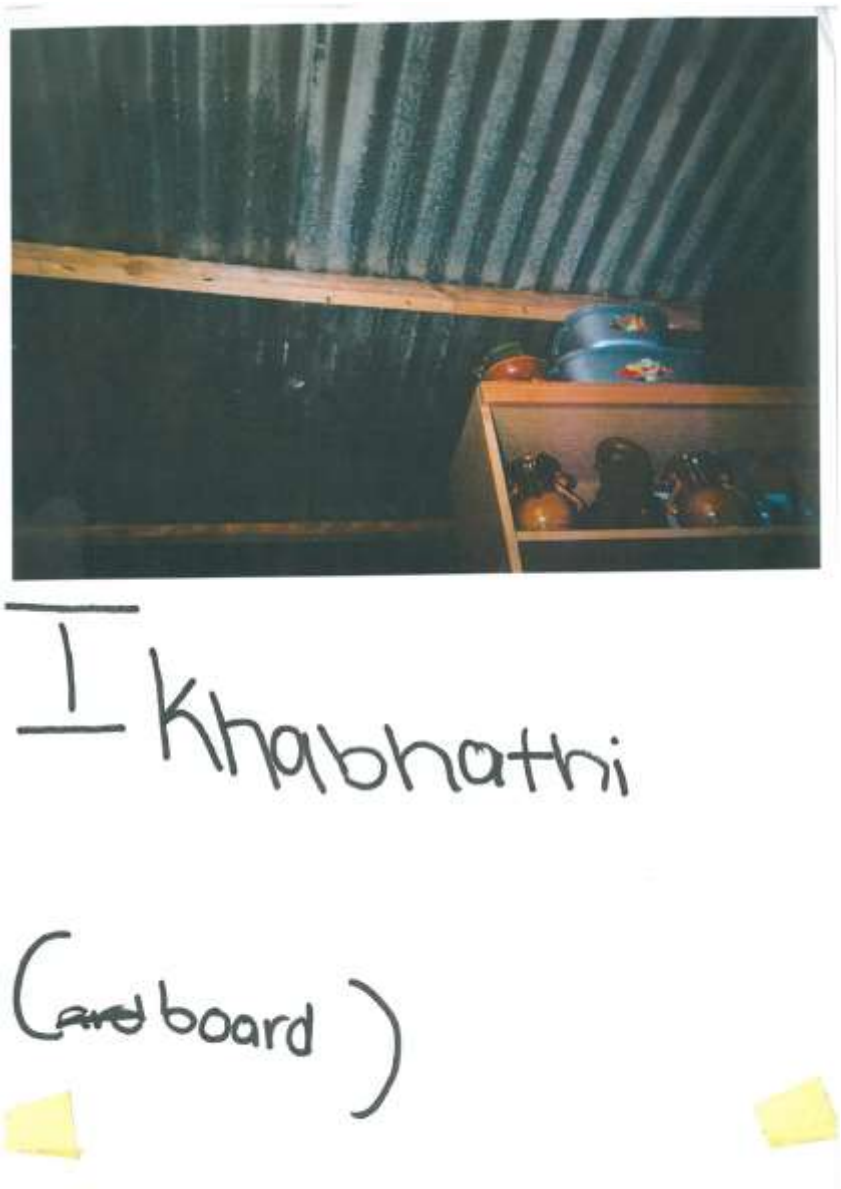

Figure 3:9: Ikhabnathi (cupboard). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

exhibited, they fleetingly activated a public by eliciting conversation about place. In this case study photographs were, therefore, a device for constructing shared meaning (Pink, 2011:437). The result of this effort is a narrative or public visual ethnography of a place of informality.

The following discussion is a description of how this process unfolded. The research used an iterative transdisciplinary learning approach based on a transdisciplinary research methodology (TDR) as I have described in Chapter One. This flexible methodology of learning from feedback as well as the co-production of knowledge was a suitable approach for this research.

Method

In this article, I firstly, explore the environment around the river to build systems knowledge. To do this, I use a photographic survey (Figures 2:1 to 2:33), structured and unstructured interviews and participant observation at public and private meetings concerned with the river. I determined that the river is at the intersection of power and vulnerabilities. The following section details the systems knowledge and how the river as a lens reveals a splintered urbanism.

Section One: the River as a lens.

Power and ecosystem services.

I travelled the course of the Stellenbosch rivers in several capacities: as a researcher for the Blaauwklippen River Forum and as a researcher based in the Enkanini informal settlement. The river is at the intersection of diverse worlds and reveals how powerful social classes capture and use resource [34]. Guy, Marvin & Moss (2001) point out how in service delivery technology, for example, wastewater and drinking water systems, powerful interests can determine the way an ecosystem is shared by shaping the technical systems of use (Guy, Marvin & Moss, 2001).

[34] A river provides the ecosystem services of fresh water, mobility and biodiversity. In addition to providing essential services for human needs, rivers add cultural value to the urban environment, providing public aesthetic space (Birkeland, 2002b; Costanza et al., 1997; UN-Habitat, 2012; Zari, 2012). The river channel also provides a natural conduit or infrastructure to move wastewater out of a city (Costanza, d' Arge, De Groot, *et al.* 1997; Doshi et al., 2007; Guy et al., 2001; Swilling and Annecke, 2012).

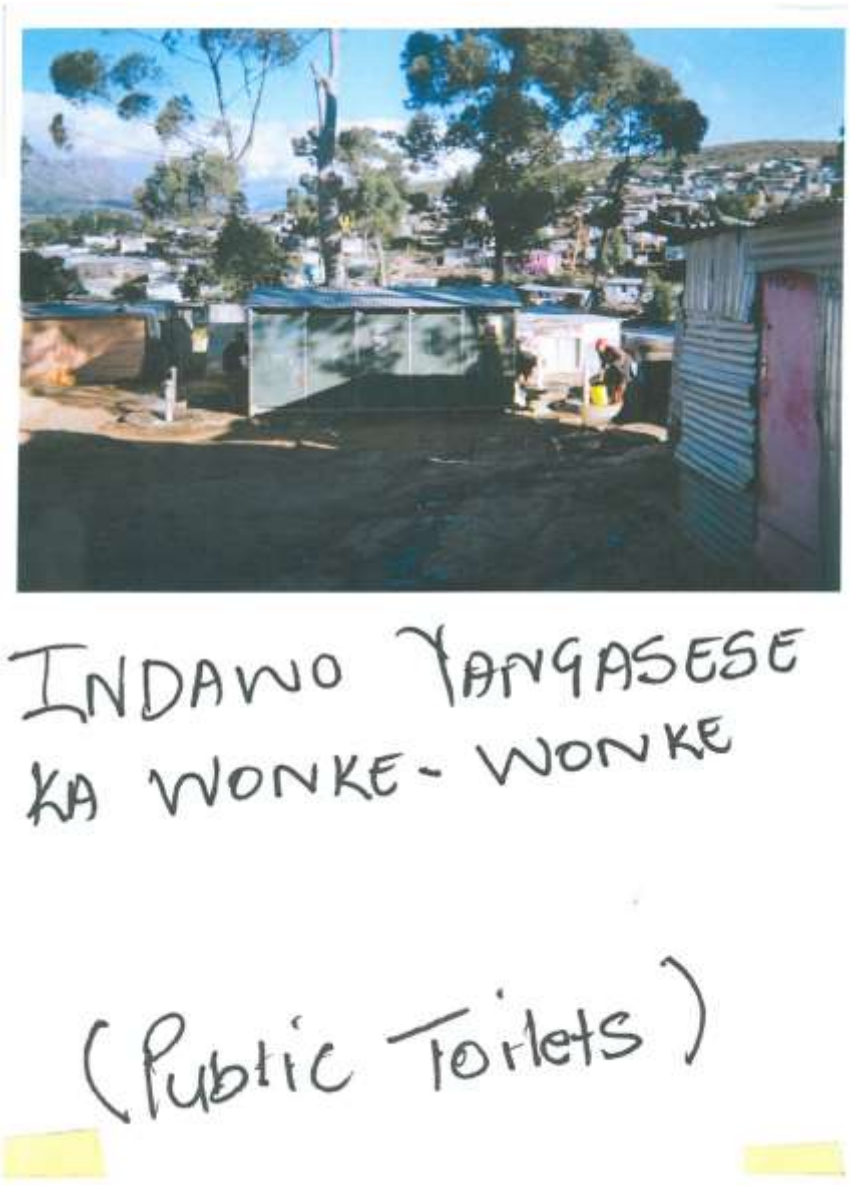

Figure 3:10: Indawo yangasese ka wonke-wonke (public toilets). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

Indeed, Stellenbosch presents as a segregated South African town. Apartheid era spatial divisions using physical buffer zones keep the racial divisions of the past permanently in place in the present. An example of the intentional use of infrastructure as an apartheid-era racial barrier is the Helshoogte Road, which is strategically located to separate the white, black and mixed-race communities in Stellenbosch (Barnard 2004). However, some divisions belong to the town's early beginnings.

At its founding alongside the river, the governing class of Stellenbosch established their dominance spatially, evident in the position of the town's first administrative building and the social-spatial arrangement of the town around the river. At the time of construction of the Drostdy, the official residence of the Landdrost or chief district official (*land* means country and *Drost* means sheriff in Dutch), the natural form of the Eerste River was spread out in braids that created islands. The Drostdy was built on one of these islands. The location of this important building reinforces the value of the river and the authority and social standing of the Drostdy. By unequivocally spatially dominating the domain of the town's most valuable resource of water, a relationship between the river and social class was cemented (Barnard 2004). In the town layout, the oldest buildings are found alongside the banks of the river. The houses closest to the Jonkershoek River, to this day, are some of the most valuable property in town.

In early Stellenbosch, the river was tied to the town's economy. It provided water for irrigating market gardens and water for powering mills. Wheat grew better in Stellenbosch than in Cape Town, and the mills were a profitable business, grinding wheat and cereals for the village. The Millstream was a conduit for water from the river. Until 1804 the Landrost (government) owned the four watermills in Stellenbosch. The profit from the Mills was subs*tantial*. As Walton (1975:38) writes: "Samuel Elserivier at Elsenberg made a considerable profit from an adjacent stream by erecting a mill for grinding corn (Walton, 1974:36–38)".

Today the link between the town's economy and the river is not visible and in some places downtown, neither is the river itself. The river is covered and channelled underground in the centre of town. In other places, highways and bridges span over it. Municipal maps (Fig. 1) reflect a break in the river, covered by dense urban space as if the river stops flowing in the built environment. This lack of visibility, materially and metaphorically, slows a realization of the relationship between the town and the river.

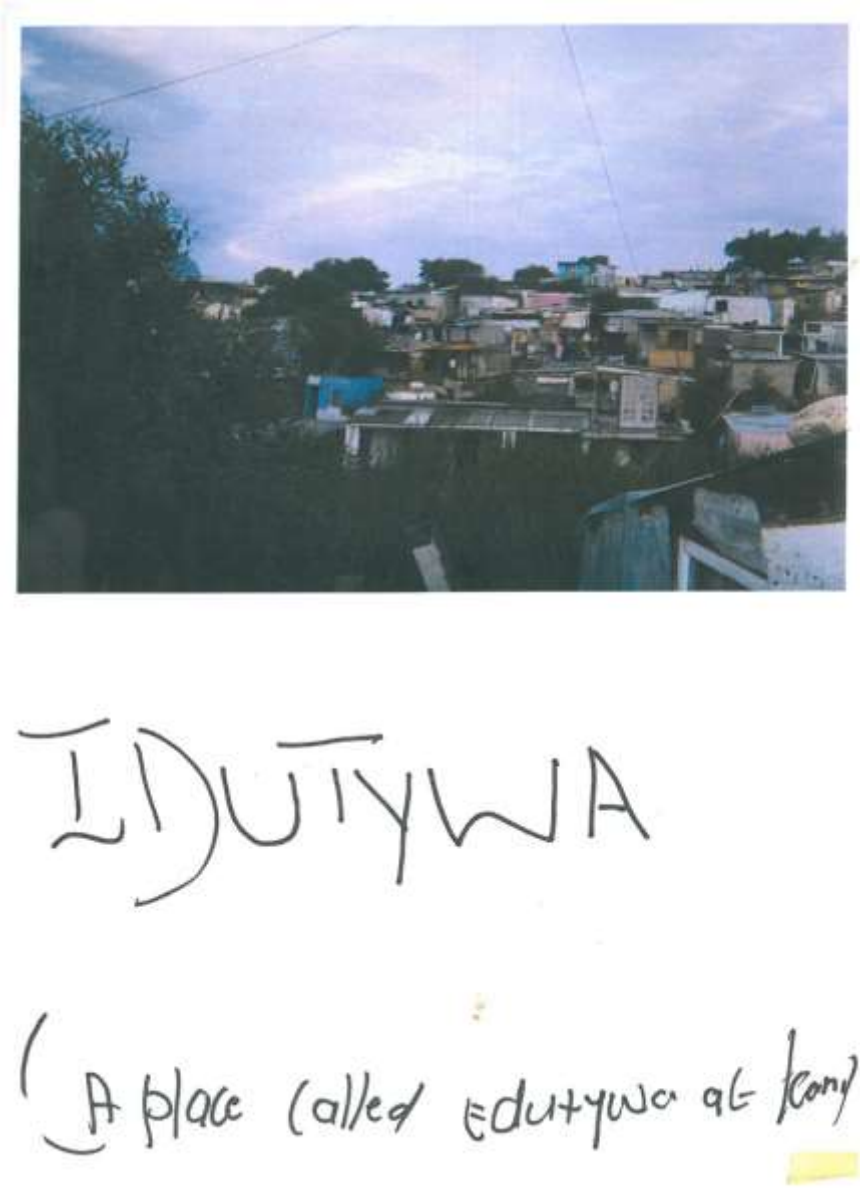

Figure 3:11: Idutywa (a place called Edutywa at Knini). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

The river in Stellenbosch thus no longer defines the place as it originally did and its relevance is not visible.

In a yearly cultural event, the river is metaphorically a construct for the heritage of the town, albeit, as I show below, an empty one. At the September River Festival, the river is a symbolic object to reinforce a construct of village life in a *pr*istine country setting. Part of the festival is a canoe race on the river, starting at the Jonkershoek River and running into the Eerste River. The organisers cannot be sure of adequate water flow, so the municipality purchases and releases a significant amount of water from the Theewaterskloof dam, to be released in a powerful gush on the morning of the race. As one of the organisers put it, this expensive endeavour is 'the river's *annual flush'.* Therefore, what the river represents and what it is to this day, is in conflict, hence, the idea that it is an empty construct.

To summarise, in the founding of Stellenbosch, power occupied the river materially and metaphorically. In the present day, the river is an empty construct as a metaphor for heritage. In this way, the river reveals a narrative of part of the place of Stellenbosch.

Enkanini

Revealing the social and spatial inequalities of Stellenbosch is the Plankenbrug River, which flows into the Eerste River close to Enkanini. The informal settlement of Enkanini is arguably one of the slow variables of the Eerste River watershed. I have described in Chapter One that a system weakness can be known in resilience theory as a slow variable (Ernston, van der Leeuw, Redman, *et al.,* 2010). Located on a steep slope overlooking the heart of Stellenbosch Central Business District, Enkanini is spatially hidden from the downtown area, and many of the downtown residents do not know where it is located. It has one toilet for every one hundred residents[35]and five solid waste collection points for all four thousand residents. Therefore, waste management as compared to formal services are not sufficient, and the ad hoc methods negatively affect the health of the Plankenbrug River and the Eerste River.

[35] 2013 statistics.

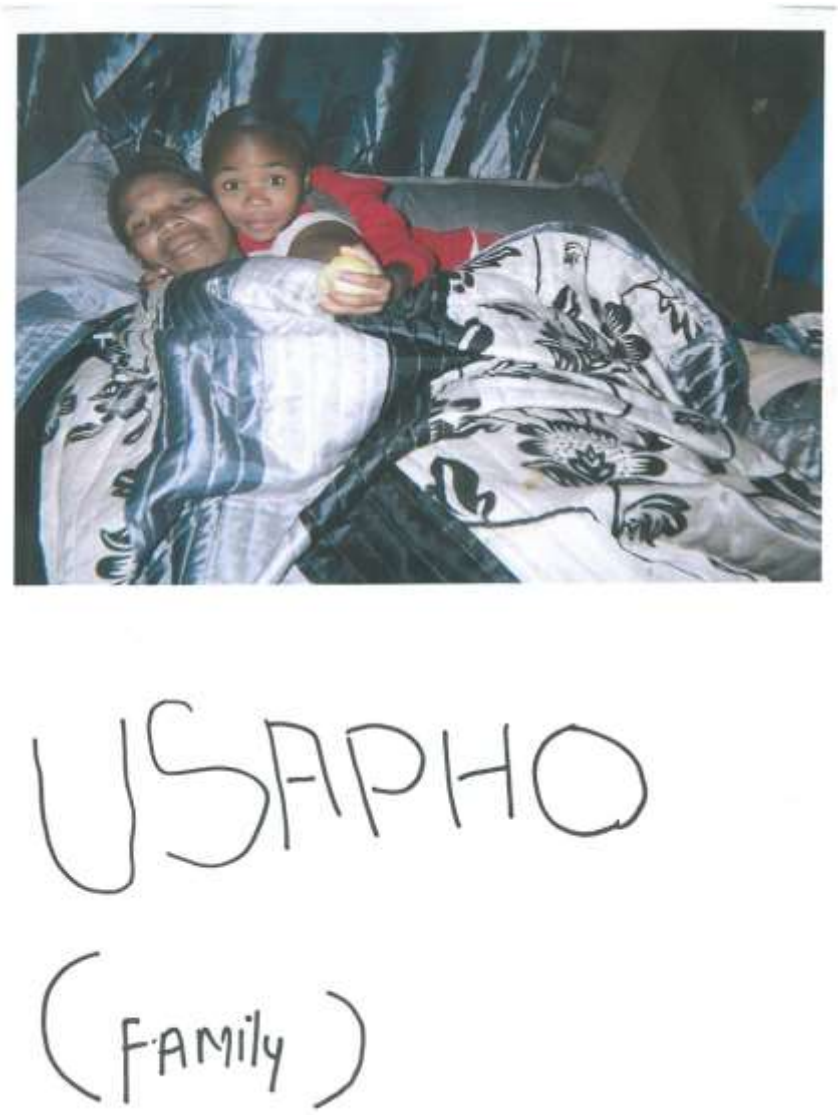

Figure 3:12: Usapho (family). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

There are no named rivers in Enkanini, but two seasonal streams run in gulleys on the hillside on which it is built. I have observed how sewage regularly seeps from overflowing and blocked manholes into these streams. A marshy seepage area collects the runoff, which eventually makes its way into the Plankenbrug River. In winter, heavy rains carry solid waste, and grey and black water downstream. The Plankenbrug River is described in the Eikestadnuus as the primary source of the river crisis in 2004. However, the Plankenbrug also carries pollutants from the town's aging infrastructure across the river from Kayamandi (Barnes, 2015).

Orthodox Infrastructure

Additionally, the Veldwachters River, which runs into the Eerste River below the Municipal Waste Water Treatment Plant, reveals the inability of the town's infrastructure to cope with rapid urbanisation. Specifically, the wastewater infrastructure cannot cope with the volumes of waste in torrential rains, which exacerbate the problem of the system's low capacity. To manage large volumes of water borne waste during storm events, up to 40% of the waste flow is released into the Veldwachters River to offset the burden on the treatment system (Barnes, 2015; Kloppers, 2014). The municipality denied this practice in 2009 (Eikestadnuus March 20th 2009:7) but the Department of Water Affairs (DWA) sued Stellenbosch in 2013 for its waste management infractions (Barnes, 2012; Infrastructure News, 2013).

In both 2009 and 2013, the Municipality denied there were any harmful pathogens in the Eerste River (Bowers, 2013; Eikestadnuus, 2009). However, high E-coli levels (Eikestadnuus, 2004, 2009) and visual evidence of polluted water and dead birds downstream told a different story (Kirsten, 2013). In the end, water-carrying waste, from all these rivers, makes its way out of the Stellenbosch municipal boundaries and into the ocean in the Cape Town municipality.

Adding to the volumes of waste seeping into the river is the sludge waste product produced after sewage treatment. The municipality used to manage this by-product on site in the closed loop system of a composting facility. This composting facility is now in disuse although Kloppers (2014) describes the compost product that was produced here as ‘sought after’ for its high quality (Kloppers, 2014). When I visited the site in 2013, contractors were undertaking a nine-month assessment of the facility so that the composting operation could be put out to tender. As of September 2015, it was still not

Figure 3:13: Eyona cawa inkulu Enkanini yile (greatest church; Enkanini). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

operational. The effluent waste transported outside of the municipality to another waste processing site (Kloppers, 2014).

The Millstream, the Plankenbrug and the Veldwachters rivers all contribute to an understanding of Stellenbosch as a town with socio-spatial divisions influenced by history, rapid urbanisation and consequences of unsustainable natural resource use. All of these rivers contribute to the crisis of the Eerste River and weaken the overall resilience of Stellenbosch's water system. .

Section Two: Methods of Engagement, listening to the territory

> The everyday act of walking, eating and going to bed in which ancient revolutions slumber.
>
> (De Certeau 1984:108)

Participation and the coproduction of visual knowledge.

To examine how different social networks of society can connect to participate in solving the problem of the river in Enkanini, I undertook a social engagement project funded by Distell[36] The funding came about through relationships I had made at the Enkanini Research Center (ERC) sanitation co-operative which I describe in detail below. I proposed a participatory photography workshop as a creative visual method for co-producing knowledge about the river. The aim was to link different social networks around the same issue. I situated myself as a creative practitioner[37]. The aim was to facilitate the co-creation of artefacts to enable commonality about the place of Stellenbosch and the Eerste River watershed. The motivation for participatory photography as a method of engagement with Enkanini is set out below.

[36] Distell is a beverage company, based in Stellenbosch, South Africa.

[37] I define a creative practitioner as a person whose practice spans visual communication in many forms. In my definition, a creative practitioner has a range of skills from both fine and applied arts. Such a practitioner may work in the public, non- Governmental organisations (NGO) or commercial space to activate narratives of identity through the process of creativity and aesthetics.

Figure 3:14: Ubumdaka (dirtiness). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini

As I discussed in Article One, photography as a boundary object holds possibilities for linking different social networks as a tool for articulating difference. Expert led community participatory processes sometimes use visual methods to bridge communication gaps. Participatory processes themselves value local knowledge because it draws on the past and the present, the imagined future, and the everyday knowledge about place. In participatory media creation, such as participatory photography, people create knowledge that is representative of them and in this way renegotiate their knowledge terrains (Tacchi, Watkins & Keerthirathne, 2009:574). Clarke *et al.* (2009) note this kind of participation unseats the expert claims about the 'truth of other people's lives.' However, expert-led participatory processes are often entrenched in issues of power such as social economic and cultural differences (Clark, Holland, Katz, Peace, 2009:354). Although participatory processes activate inclusion, as Tacchi *et al*. (2009) point out, inclusion remains a negotiated process, despite participatory methods (Tacchi, Watkins & Keerthirathne, 2009:575).

Photography is a creative practice, one which is often employed in representing social issues and in the realm of art for the sake of learning how to inhabit the world in a better way (Bourriaud, 2002:13). Bourriaud (2002:13) writes art is less object and more social activity when the artist is concerned with relationships and dwells in the present the world offers him/her and not an imagined utopia. As I have discussed in Chapter Two, creativity is a type of social capital that builds resilience. The example from Puleo (2014: 574) and her work with art in post-disaster zones reinforces this idea. Photographs are tools of design thinking, useful for reimagining scenarios. Photography employs creative aesthetics. When used as a social activity, photographs can contribute to strengthening social capital, and social capital, as I have previously discussed from Adger (2000) is a way of measuring social resilience. Therefore, I set out to engage in Enkanini using photography as an aesthetic social activity to co-create knowledge about the river, which I aimed to share with downstream networks.

Le Roux and Constandius (2013:106) describe participatory creative processes led by creative practitioners in urban public space as *community development*. They point out that in South Africa, these types of social activities often fill a void in existing community development because of lack of government capacity to provide creative opportunities. This lack of capacity, these authors continue, creates an opportunity for artists to engage in communities in experimental ways. However, these authors also have insight into the

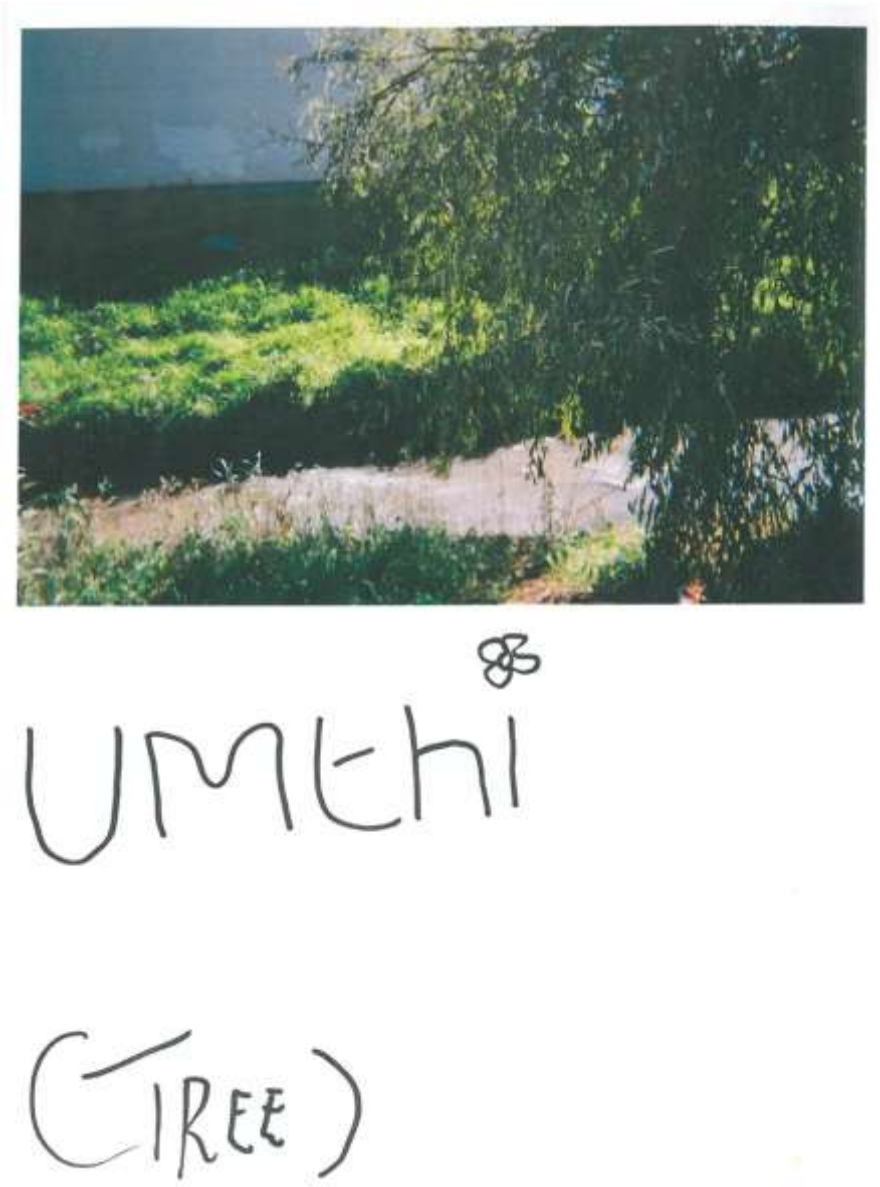

Figure 3:15: Umthi (tree). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

dangers inherent in such participatory creative social activities. One of these dangers is imposing a voice onto the voiceless Le Roux and Constandius (2013:112).

Le Roux and Constandius (2013:113) describe the artist Breitenberg's public artwork, *These Three Remain* (2011), an art installation in Enkanini in 2011 as an example of some of the pitfalls of a participatory creative process. The artist Breitenberg's installed paintings of religious texts on the side of people's homes without fully establishing permission from homeowners [38]The artist thereby entered, as le Roux and Constandius (2013:115) point out, into an arrangement of *taking* permission and imposing a voice onto the community. During this research, the remnants of Breitenberg's project were slowly being disassembled and reassembled in multiple changing configurations, as the material he painted on was reconfigured in new buildings. Despite the artist's intentions, the project became reconfigured and tracking its appearance and reappearance was a novel tool in this research for mapping the consistent change of Enkanini, as well as a reminder of good intentions and unintended consequences.

Le Roux and Constandius (2013:108) use the example from Breitenberg to discuss helping behaviours. There is, they argue (Le Roux & Constandius, 2013) a normative desire to engage in difference, diversity or poverty through helping behaviours. They suggest that helping behaviours alleviate the burden of white guilt (Le Roux & Constandius, 2013). These authors propose that the helping position is one of power and the receiver remains in a position of weakness and imposed compliance (Le Roux & Constandius, 2013:109). Thus, it is an entrenched condition. The question that they surface; is it possible to engage without affirming a need for help (Le Roux & Constandius, 2013:119)? This question influenced this research, as I will explain below.

As a facilitator in participatory processes, the creative practitioner, as an expert, holds a position of power. Le Roux and Constandius (2013:118) argue that a creative practitioner involved in community development needs to connect with the mutual and equal humanity of the people and the place. Put another way, Sirolli (2014) insists that to maintain the integrity of community engagement, one has to be *invited in*. Both of these

[38] According to the authors Le Roux & Constandius (2013) Breitenberg describes how he obtained permission to paint on homes from a group of community elders. However as Tavener-Smith (2013) finds, the power hierarchy in Enkanini has no cohesive leadership or representation (Tavener-Smith, 2013). Therefore, the elders Breitenberg refers to would not have been speaking for the entire community.

Figure 3:16: Ndiypyi yanda (beautiful). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

positions reflect the problem found in my efforts to collaborate with residents of Enkanini in the research as co-researchers through the Enkanini Research Centre (ERC).

Listening to the territory.

The ERC is an ecologically designed building, was built in 2013 by researchers at the Sustainability Institute as a space to collaborate and carry out co-research. It is located on Snake Road in Enkanini and took two months to construct at a cost of R63 000. It was built with used tires and adobe brick and is ecologically designed for optimum solar gain[39]. It is fifty square metres in size with one large and one small room, a kitchen and a separate ecologically designed grey water flush toilet. It is R1000 more expensive than a government provided Reconstruction and Development Program (RDP) house, but it is more energy efficient (Wessels, 2014). There is one resident in the ERC who also runs a small catering business for visitors. The building has a projected fifteen-year lifespan and is owned by the University of Stellenbosch.

The ideology behind the ERC is to facilitate the transdisciplinary processes of co-research and co-design. Residents as co-researchers participate in knowledge building processes as everyday people from society collaborating with science. The ERC space provides researchers and co-researchers with the opportunity to meet, discuss and produce projects. It is a testing ground for innovative technologies such as solar power, grey water toilets and a biodigester for waste. TDR researchers learn how people operate in poverty (Wessels, 2014). Wessels (2014) describes how the ERC came about through the relationships he and other researchers established with residents of Enkanini in 2012. He argues that the ERC attracts people with integrity because it is built on these long-standing relationships.

However, co-research is not straightforward. For example, in the ERC sanitation innovation, a cooperative was established that included researchers and residents. However, interpersonal difficulty between researchers and co-researchers surfaced, and a communication breakdown amongst the co-researcher group caused the collective to be abruptly disbanded.

[39] In other words the building's structure is designed to optimise sunlight, so that it is cool in the summer and warm in the winter.

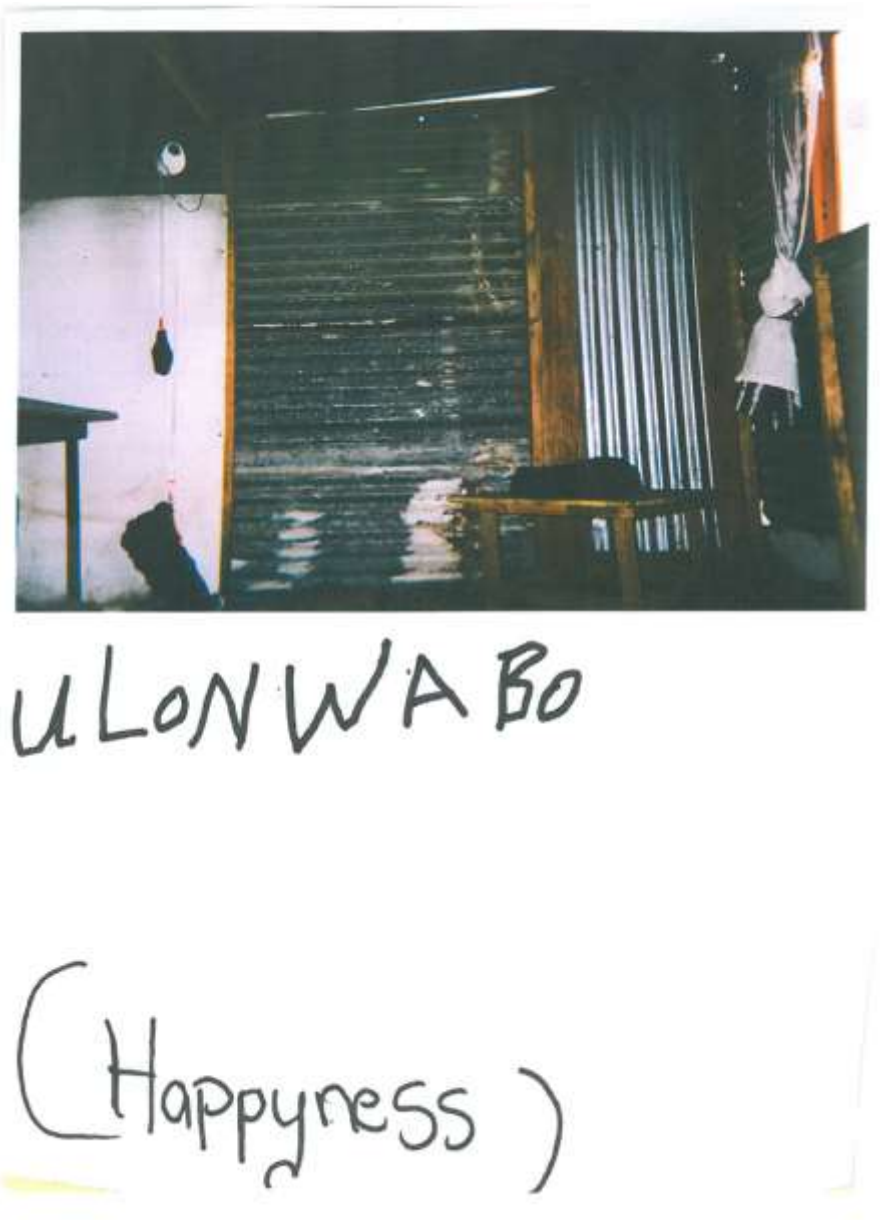

Figure 3:17: Ulonwabo (happiness). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

Despite this, the ERC serves to facilitate critical engagement by researchers with the Enkanini community, as ‘an interaction portal’ where researchers, visitors and residents come together in a setting somewhat apart from the general political volatility of Enkanini (Wessels,2014)

At the beginning of this research project, the co-researchers of the ERC based sanitation project expressed interest in a proposed participatory photography. However when the co-operative became disbanded as I have explained above, a new challenge emerged to establishing new relationships outside of the ERC projects.

Walking became the first method of engagement to do so which I will now explain. I teamed up with another researcher, and we walked into Enkanini three times over a period of two weeks, initially, to survey. We walked towards but not destined for the ERC, looking for patterns and themes, stories and accounts of life, and seeking something as a starting point. This walking was also a method to overcome our fear and stereotypical thinking. In field notes about the initial survey enquiry I write:

> When walking up Snake Road, I was very aware of our potential for attracting unwanted attention, with the promise of cameras and phones. It was my initial assumption that we had entered a potentially dangerous space. I kept very alert to everyone we passed and greeted whoever made eye contact. There are people everywhere all the time, particularly women with children and we walked and talked and continually greeted people.
>
> As two white women, entering into the informal settlement of Enkanini we are immediately both strange and uninvited. We have decided to come. However, quite quickly, the perceived threat or danger subsided and we felt quite safe, but remained "strange or the other”. March 2014, Stellenbosch.

Through walking, my colleague and I established a way to engage with women residents of Enkanini by co-facilitating a craft workshop at the ERC. The women, some of whom my colleague knew from earlier projects in Enkanini, wanted to learn crochet.

From this point on we could have driven to the ERC, but we made the decision to walk to the workshops. In this way walking continued as an ongoing learning process, to establish new systems knowledge and know the territory. Through this practical method,

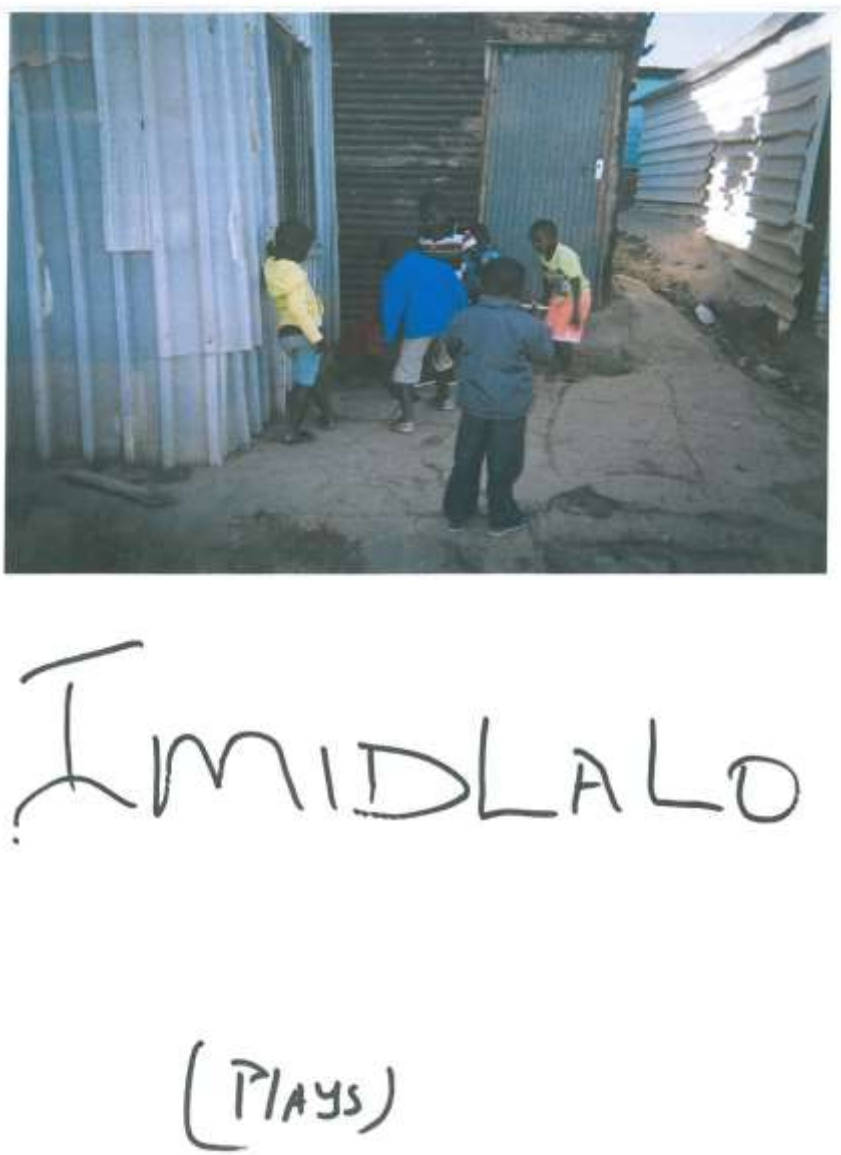

Figure 3:18: Imidlalo (plays). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

we noticed when there were shocks to the system, the ongoing resilient and original adaptations and incremental upgrading of houses, water sources. I also observed how communication worked in an informal settlement through the shop signs, political campaign posters and health notices distributed door to door. The following discussion describes how walking became a way of building knowledge about Enkanini, making meaning in Enkanini and establishing a way of being in Enkanini as a necessary and relevant first step towards facilitating participatory photography workshops.

Walking, a pedestrian enquiry.

The walks became a ritual of crossing boundaries and entering into new space while at the same time we also felt vulnerable and uncertain. We were the only two white women, and often the only two researchers at the ERC. The walk activated fear and tension and built knowledge of place and the places knowledge of us. From my field notes, I write a reflection of the feeling of doing the weekly walk.

> I am fifty-one, and my colleague is in her twenties, and the two of us make up an observational team that gathers contrasting knowledge and responses. This contrast provides an interesting tension. The weekly walk is each time different, as things change overnight in Enkanini. April 2014, Stellenbosch.

I situate these observations as hunches that guided the research method of walking. Walking as a method for knowledge creation is underpinned by the theory from De Certeau (1984), Ingold (2011) and Leach (2011). De Certeau (1984:105) writes that ordinary people follow the “thick and thins” of an urban text, making networks of meaning, building sense into the spaces of a city by linking everyday acts with footsteps. Walking is the ‘pedestrian unfolding of stories’ that have accumulated in place and the spatial practice that creates a metaphorical city (De Certeau 1984:110). Thus, another way to know the constructed landscape is how in how it is experienced in the everyday activity of walking (De Certeau, 1984:93).

Indeed, my colleague and I started to understand aspects of the space of Enkanini by moving through it. It exposed us to changes in the continually reassembling environment of informality. In addition, we were visible to the system as *the other.* At times, we recognized possibilities for acute vulnerability that dislodged any sense we had of belonging. For example, one afternoon we encountered a police sweep of the

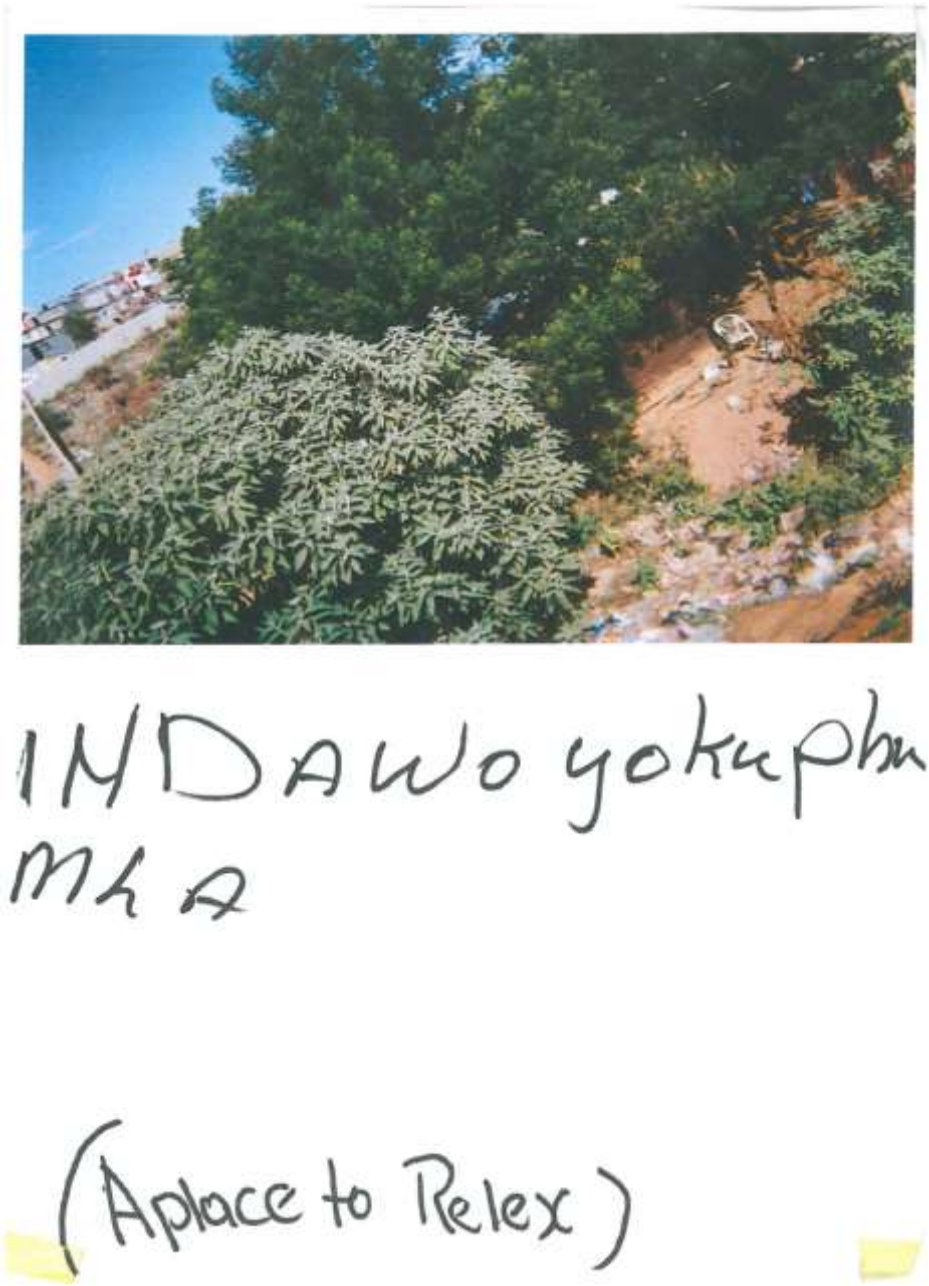

Figure 3:19 :Imdawoyokuphumla (a place to relax). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

barbershop and shebeen[40] located on our route. Police reportedly uncovered weapons implicit in the fatal shooting of a policeman in the surrounding area. This event reminded me of my difference lest I forget it in the novelty of discovery. It threw into question the feeling of belonging brought about by this walking research approach. In a reflection from field notes;

> One day I was reminded of danger, vulnerability, poverty and violence all at once when a heavily armed police tactical team was at the bottom of the road outside the shebeen. Their presence was related to a recent police murder and arms theft in Klapmuts. They arrested someone and left as quickly as they arrived. May 2014, Stellenbosch.

Walking as a knowledge creation method is also explained by Ingold (2011:143) when he writes that the experience of space is not static as moving through space makes knowledge and place. Ingold notes (2011:143-152) that walking through space or wayfaring is our most fundamental way of being in the world. Following Ingold (2011:160) wayfaring is a way of experiencing space by making pathways that reflect stories about people and where they come from and where they are going. This creates knowledge about both place and identity. De Certeau (1984:107) observes that walking opens up possibilities, where practicing space is the *other* moving towards the *other* (De Certeau, 1984:110).

Towards the end of the case study, an incident stands out;

> On the last walk down hill, the Friday evening before the pop-up show, a woman behind us interrupted our conversation with this comment:
>
> > "it is so good to see you people walking in our place". May 2014, Stellenbosch.

[40] An informal café serving alcohol.

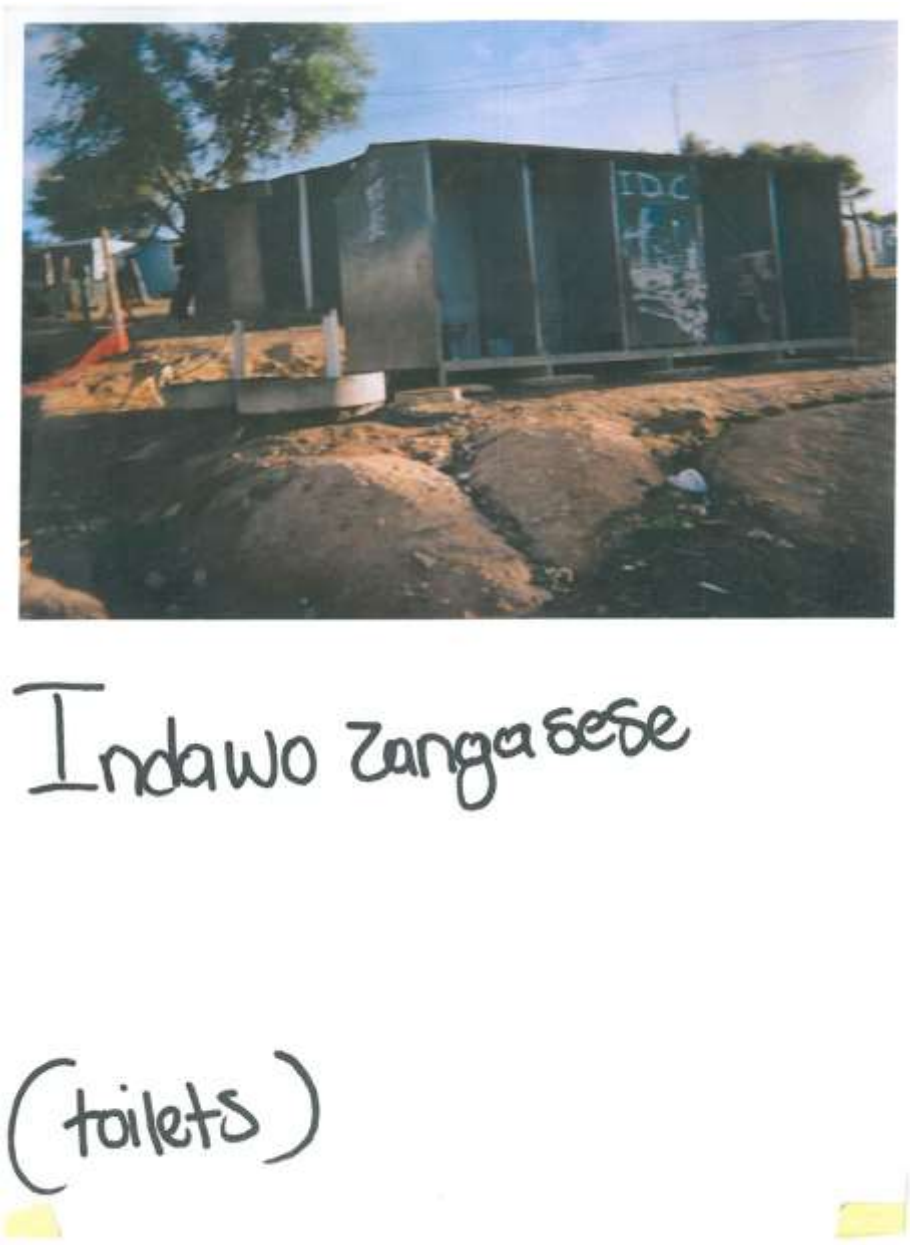

Figure 3:20. Indawo zangasese (toilets). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

Her words summed up our intent and revealed the wish to be seen as part of the place we were walking in, and not as a representative of a type of authority, service or agenda, but as people walking in a place. We walked into a new social network as foreigners and gently forged our pathway. Our walk in the system changed us, and it is this woman's comment on the last day that allowed me to consider that our walk also affected the system.

Ingold (2011:142) describes people in the place they inhabit as part of a relational meshwork, in other words, relationships that overlap and intersect in a form of belonging. Classification, he argues is not that useful for describing a meshwork because people are not modular units, although modern thinking, for example, standardisation would like us to believe so (Ingold 2011:146). Max-Neef (1983:20) also laments the current approach of classification, measures and indicators, and its enormous costs. He calls this a ‘kind of bizarre ritual.'

Whereas an everyday ritual such as walking is a device knowledge creation by experiencing space. It was clear that being in the field can result in valuable human scale observations and reveal narratives about place (Max-Neef, 1983).

People perform space by moving through it and in this way make space into place to inhabit and to which they belong (Ingold, 2011:146). Leach (2002:284) echoes this idea, of performing space. He writes: people colonize space through the action of walking, which is a performance of belonging (Leach, 2002:286). Leach (2002:287-289) echoes Ingold (2011) that space is not static and belonging to an environment is ‘performed'. He expands this idea to the collective, where meaning is given to an environment through collective behaviour. In this way, the environment serves as a screen onto which we project meaning and also from which we read meaning. Leach (20012:286) is saying that identity is a practice that marks out terrains of commonality (Leach, 2002:286).

Learning through making conversation.

As I have discussed above, our research team established craft workshops in response to what we found in a walking enquiry. My colleague's objective for the craft workshop was to teach product development for income generation. In the workshop, I learned to crochet and participants played the role of teacher and learner interchangeably. The

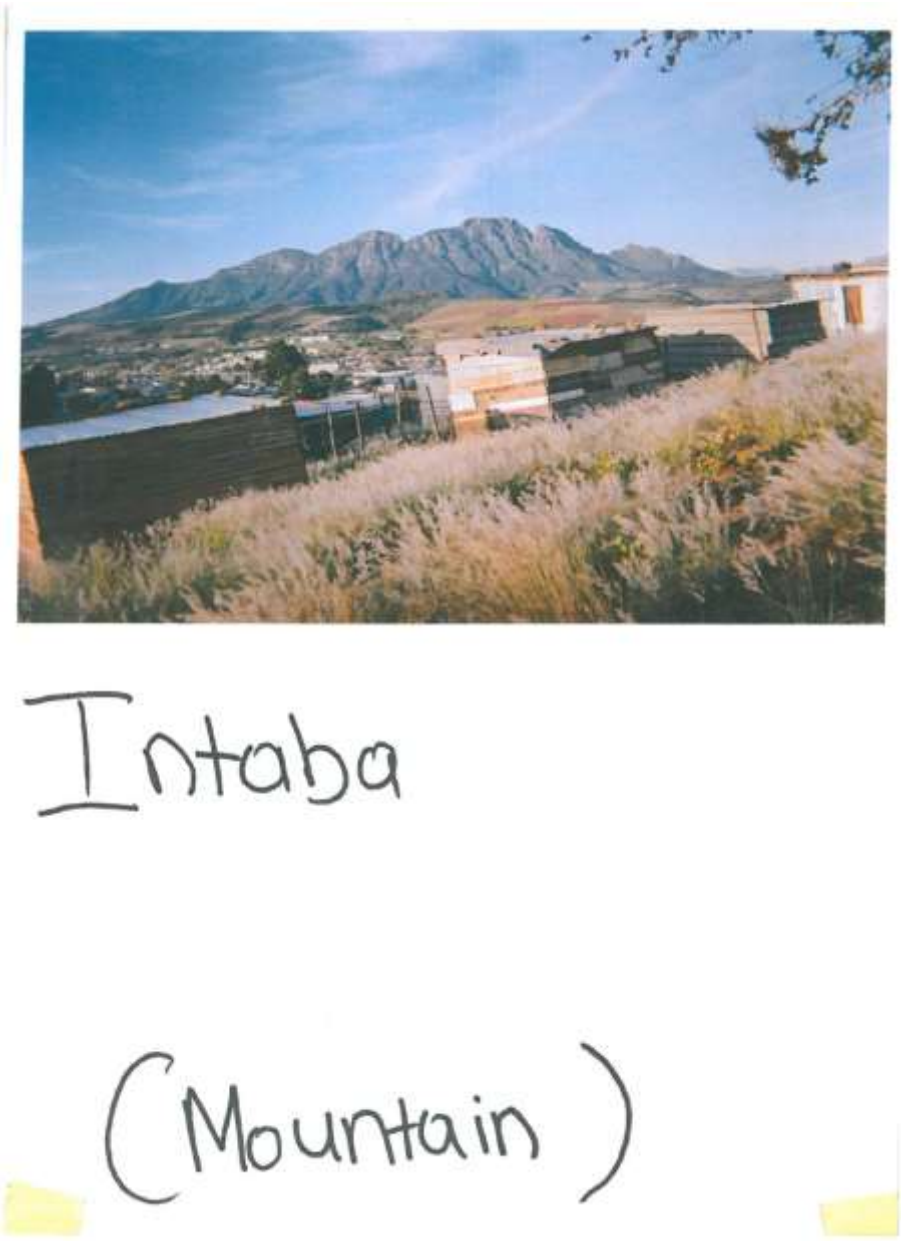

Figure 3:21: Intaba (mountain). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

crochet workshop was conceptualised as a circle of making, and this concept proved to be an important anchor for describing this social interaction[41]

In these workshops conversations emerged which established deeper relationships and this built trust, which led to the opportunity to facilitate participatory photography workshops as I will explain in more detail below. This layered and indirect method of walking and conversation proved a successful way to engage. The data collected in the conversations revealed the complex nature of the place of Enkanini to the researchers, and by the time cameras were introduced, the participants were enthusiastic about the photography and engaged in a dialogue with the researchers.

The conversations were simple everyday narratives as we regularly sat and crocheted. Very slowly, by sharing knowledge in dialogue, genuine interaction, trust and relationships began to build. Therefore, conversation was a natural and useful way to establish relationships. As Stevenson (2011:276) points out; "Conversation is the primary medium through which social interaction takes place". It is in relationships and interaction, according to Latour's (2005) actor network theory, that the social and society is constructed. The natural dialogue method in the crochet circle established a basis for collaboration and trust. The river was occasionally discussed in these conversations as a story of a connected system or watershed, and I provided a map of the watershed when one of the participants asked for one. In Enkanini things that directly relate to the river, such as sanitation and running water are very politicised and tied to the failure of political promises of service delivery.

Community?

I will now discuss some of the narratives that illustrate the complicated and complex concepts of community and self-organisation in Enkanini. Both Ingold (2011) and De Certeau (1983:110) describe on the role of stories as ways people are woven into a place and how stories build and reflect identity and belonging.

[41] At the very end of the research period the group participated in a one day *Maker's Library* event in Cape Town organized by local artist Heath Nash and funded by the British Council. The purpose of a Maker's Library is to share knowledge about making, based on a 'circle of making'. Sharing is between experts and non-expert and in this case, using recycled materials. Our crochet group was continually experimenting with using plastic as a material as it was a free material.

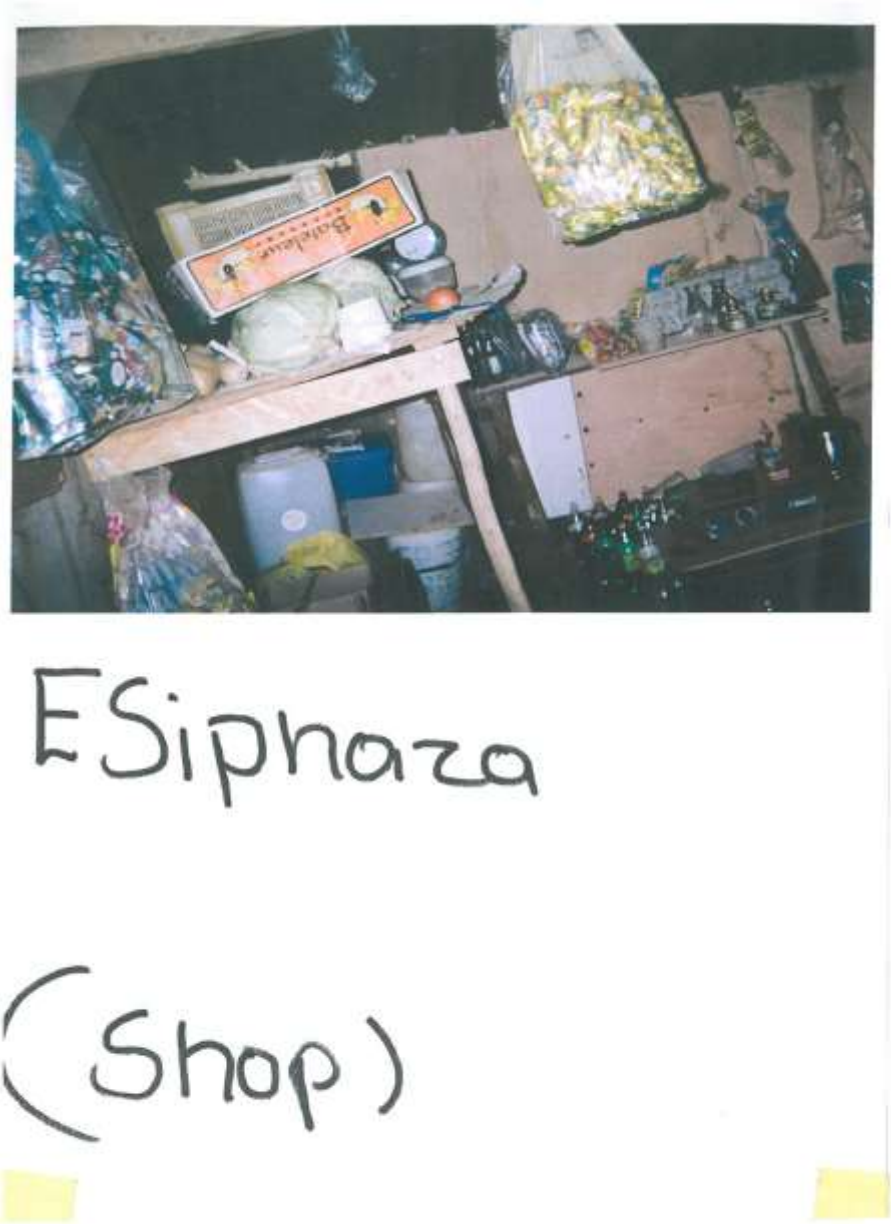

Figure 3:22: Esiphaza (shop). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini

There was a notable contrast in quality of data between the conversational stories and structured interviews, which reinforced the value of conversation as data collection. For example, in structured interviews (Enkanini, April 2014) the question of *what does community mean to you* was answered with some predictability. Catch phrases such as *'working together'* and *'together we can*' echoed the recent 2014 March election campaign slogans. In contrast, two stories emerged from natural dialogue that are worth noting here. The first story describes an idea of community as it relates to an *other.*

The story was told to me in this way.

> A Somali shopkeeper allegedly cheated on an Enkanini resident. The resident had taken his phone to the shop to be recharged, and after collecting it from the Somalian shopkeeper who had provided the charging service, he noticed it was not fully charged. He then returned to the shopkeeper who in response to the complaint threatened the resident with bodily harm. The resident left and later returned with a crowd of neighbours who proceeded to burn down and destroy the Somalian shop and chase the shopkeeper out of Enkanini.

The fear of being an *other* in Enkanini is evident in the foreign-owned shops, which are barred and barricaded. People make their purchases through the bars. This physical barricading arguably reflects the insecurity the shopkeepers feel as burglar bars can be an indication of perceived threat and fear. Most homes in Enkanini also have burglar bars, but not to the same degree that the shops do. The story illustrates how a community coheres in taking care of one another, in this case defensively and violently, arguably because of the vulnerabilities in this slow variable.

Names and identity.

The second story is about naming. The lack of names of roads, areas or the river in Enkanini reinforces the sense of vulnerability of this part of the system. Residents typically refer to places in Enkanini by their proximity to one of the many churches, thus anchoring a concept of place in relationship to a centre of spirituality. The Municipality refers to places in Enkanini as the alphabetical letter sections A-H (2014). Houses are numbered following this model, e.g., 45-H**.** In one unusual instance, one of the co-researchers located her house in relationship to the river, without giving the river a

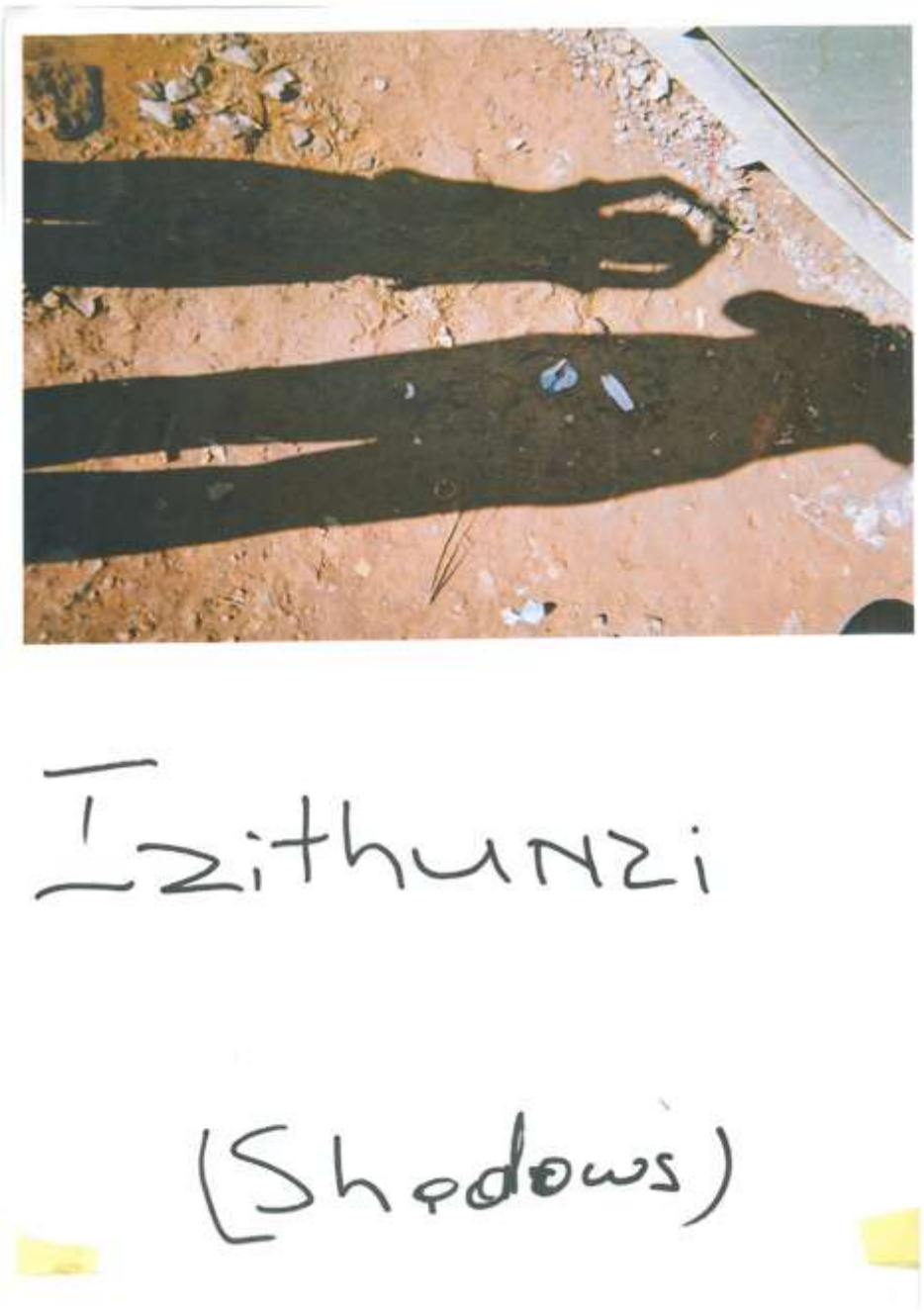

Figure 3:23: Izithunzi (shadows). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini

name. Another spoke of the other side of Enkanini, as *Idutywa*, using the river as the boundary to create and delineate the other side.

As aforementioned, the rivers in Enkanini have no name. The geography of Enkanini is located on two seasonal runoff streams that flow throughout summer due to urban runoff. They also have no names on maps of the area. These runoffs contribute to the Eerste River watershed system but arguably with no names, they have no story. Ingold (2011:143) describes how in the Alaskan Koyukon culture, to name something is to tell its story and indeed for them, knowing is storytelling. Other locations in Stellenbosch have names that evoke history. For example Moodernaarskloof River (Murderers River) is a tributary of the Blaauwklippen River (also known as the Blouklip River) and describes a history of a place used as a hideout by fugitives from the law. Even the simply named Kromme River means the bend in Afrikaans and describes a geographic event, a turn in the river. A lack of a name, therefore, suggests a lack of history and a lack of identity. To live somewhere where there are no names for these geographies has implications for vulnerability. The lack of identity and history imply weak social fabric and social capital and, therefore, weak local resilience.

The first time I heard the runoff streams in Enkanini named was when one of the co-researchers took two visiting anthropologists and myself on a walk along these streams. He used the term *Emankazana*, which refers to a place where single women live. Single women with children are socially vulnerable. In Enkanini, they inhabit the banks of the river, which are arguably physically vulnerable. The river is prone to flooding, and the banks are prone to mudslides. This shows how within Enkanini, a social vulnerability exists in parallel with the physical vulnerability of natural systems. The single women live here in shacks built right up against or in the reeds, where water can collect and dam, which creates a flood risk. To offset risk, residents have built drainage areas around the back of the shacks. While we were visiting rain threatened and a young man was digging a drain. The residents of this section have only one makeshift tap, installed by the Stellenbosch Civic Association[42]These women are a social group on the margins of their social group and represent a vulnerability that parallels the vulnerability of the river and

[42] The Stellenbosch Civic Association is a non-governmental organization providing some services in Enkanini.

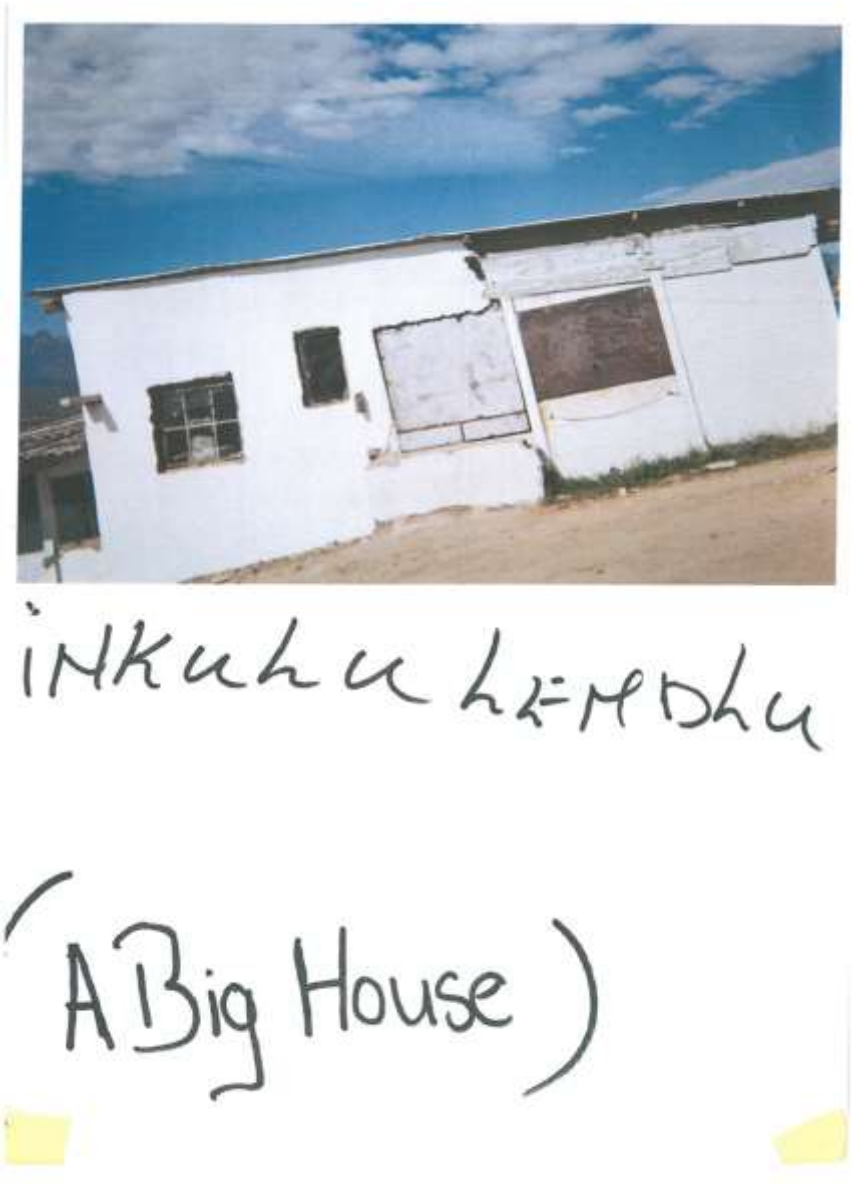

Figure 3:24: Inkuhuhlemdhu (a big house). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini

at the same time reinforces their vulnerability. The river at times of flood can increase the women's vulnerability by flooding out their homes.

Stories and themes on community and place emerged during the conversations and were reinforced later by the photographs as I will describe below. The conversational stories built a basis for the more detailed photographic enquiry. After four sessions of crochet, I introduced disposable film cameras and asked for participation in making photographs of the neighbourhood and community. The camera as a visual storytelling tool followed on as a natural extension of the conversation in the circle. I was not comfortable with asking the five co-researchers to focus on the pollution in the river, as it appeared contrary to reiterate the problem. As this is an opinion, it is not based on any evidence. I instinctually preferred an approach to photography as a way of externalising the themes of community and neighbourhood that were already subjects of the conversation around the crochet table. In this way, I preferred to facilitate the construction of knowledge about what is familiar, an approach reiterated by Mitchell and de Lange (2011:172) in their participatory video projects in South Africa.

The co-researchers photographed in five rounds[43] I developed and printed each round and reviewed the pictures with the photographer in one-on-one conversation at the crochet-making table. My role as expert was to encourage the co-researchers to follow their interests around the themes aforementioned of neighbourhood and community. The camera is, for an amateur, a relatively easy tool to produce aesthetically pleasing and creative images. Indeed, as Harper (2010:18) notes, people can creatively record their worlds using basic equipment of the camera. I provided some technical instruction and showed examples of well-known South African and American photography as examples and inspiration.

[43]. One round means one camera and thirty-six images. Each co-researcher used a total of five cameras in five rounds of shooting.

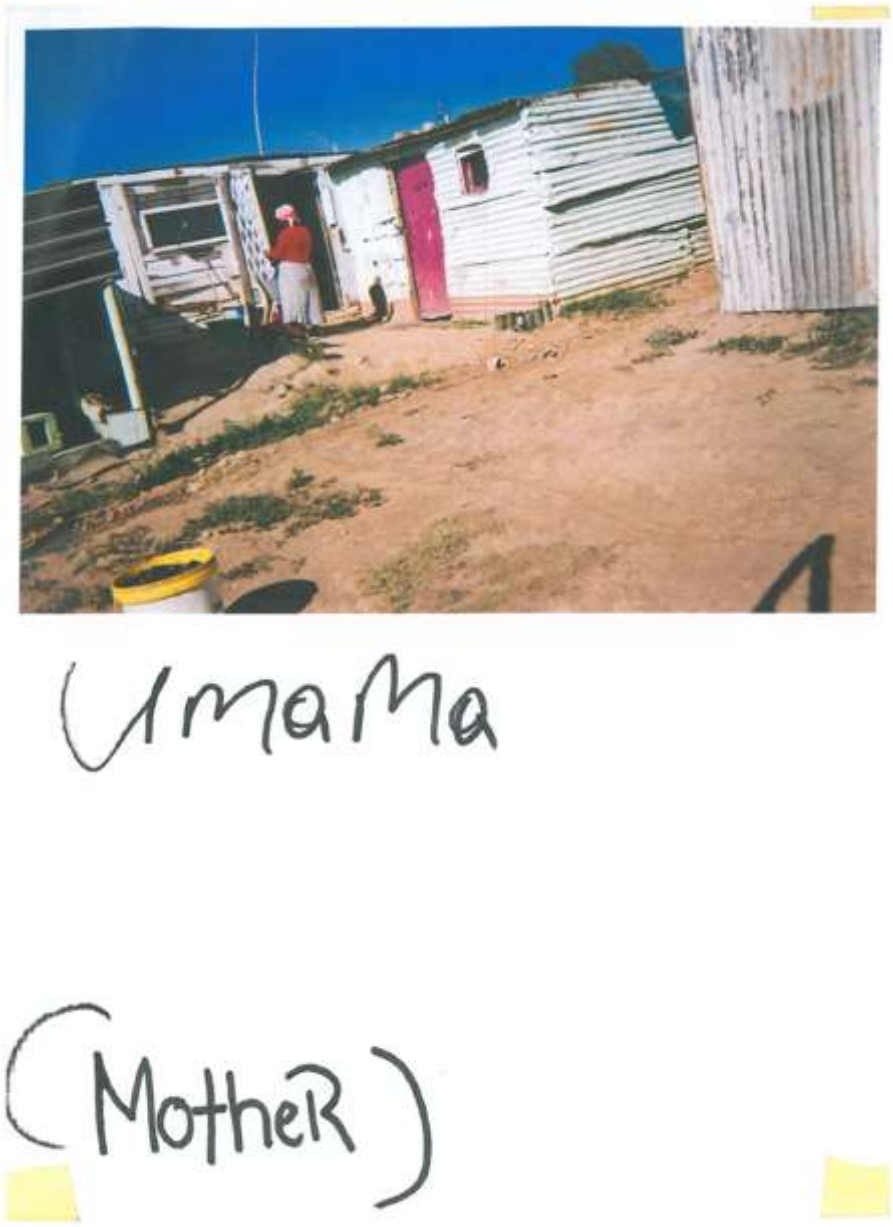

Figure 3:25: Umama (mother).Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

Section Three: A public visual ethnography of place.

Seeing place.

In participatory media activities, Mitchell and de Lange (2011:172) define collaboration as an expert collaborating with non-experts, whereas participation is participants constructing media themselves (Mitchell & de Lange, 2011). This research was participatory in that the five participants created media. My role was creative practitioner and facilitator. I found that participation can be an expert-led process where participants follow instructions or a self-organised process, where participants make up their rules and processes. Participation and inclusion are complex, shifting and negotiated field yet fundamentally important, as Hamdi (2014:58) proposes, for human development.

The photographs made in the workshops were an intimate portrayal of family, home life, and the neighbourhood. The images revealed the vulnerability and resilience, resourcefulness and community of every day (Parvez, 2011). An ambitious hope is that they represent daily life in an African informal settlement on its terms (Pieterse 2010). Looked at as locally made images containing knowledge (Figs 3:1-3:27) these images communicate multiple narratives or as described earlier, are multivocal (Banks, 2001:25).

Activating knowledge.

After three months, our collective work (photography and crochet) culminated in a two-day exhibition in the church opposite the ERC. As a group, we arranged this two-day event and described it as a pop-up show to mimic the idea of a permanent storefront. We planned to show photography and sell crocheted items. During the event, the photography exhibit surprisingly activated public participation in naming the photographs as I will now explain.

I installed the pictures as a grid, with space for hand-written text below the print. The hope was to elicit more information using the photographs in a straightforward photo elicitation method. This writing activity was left to the last minute so as to prompt spontaneity and creativity. However, the co-researchers were all late and therefore, we had an unorganized start, and the images still had blank spaces when the audience began to arrive.

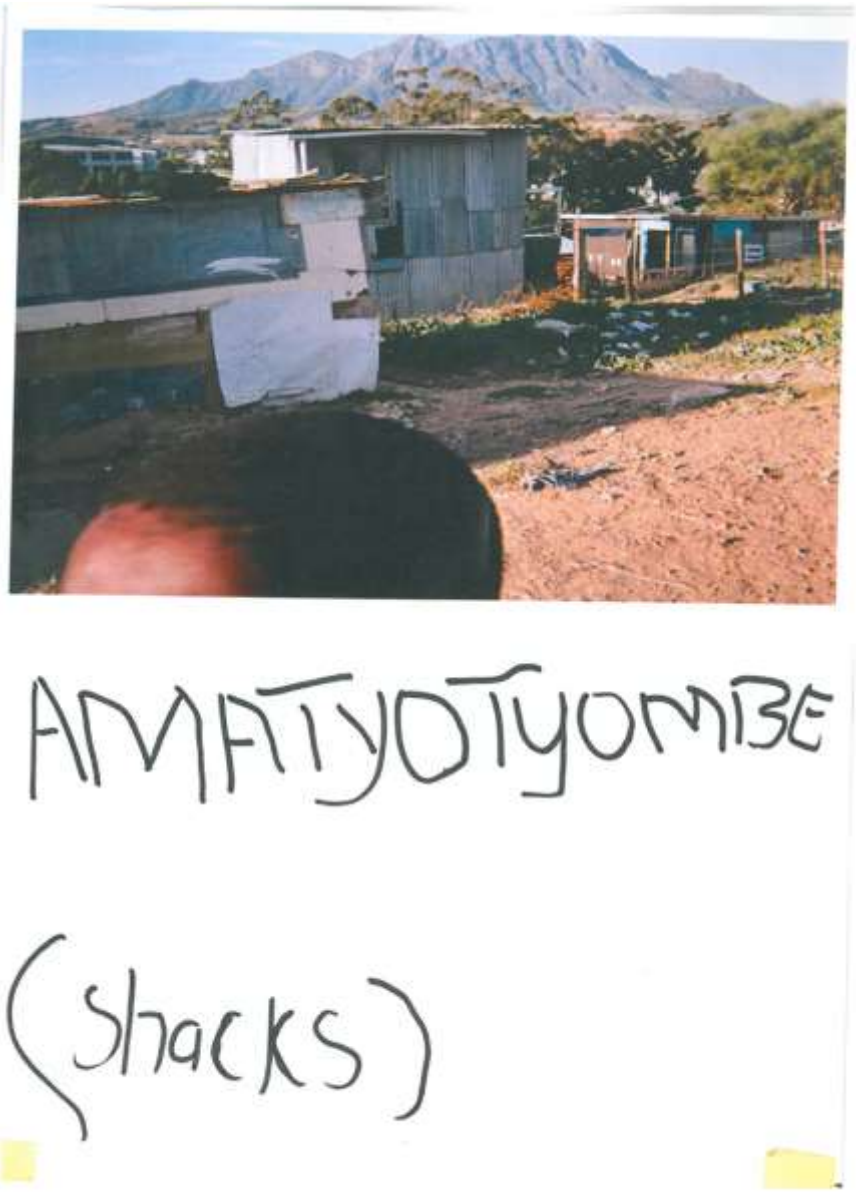

Figure 3:26: Amatyotyombe (shacks). Informant Photograph: Participatory Photography Project, Enkanini 2014. Informant Text: generated during exhibit, May 2014, Enkanini.

Due to this late start, at the same time as people entered to view the show, one of the photographers began naming the images. In the blank space below the photo, he wrote one Xhosa word as a description, with its English translation in parenthesis. Some members of the audience started to contribute to the naming, which continued until all the images were ‘named' by approximately twenty people. During this process, which lasted over three hours, there was lengthy discussion and review amongst the audience that came and went, about the pictures and the words. Although Xhosa was the primary language spoken, I understood with the help of some translation that the discussion was about collectively agreeing on what the image represented. The images showed the surrounding neighbourhood, and, therefore, in this process, the residents as a public participated in concretizing the meaning of the photographs and thus applied collective meaning to their neighbourhood. The exhibition thus became an arena of exchange, a momentary grouping of collective ideas. The photography as art and information activated new relationships and new knowledge (Bourriaud, 2002:17).

An applied ethnography.

The momentary public sparked into being by the photographs was a *novel* development. As objects, the actors interpreted the photographs subjectively, and meaning was projected onto them, in the same way, an actor projects meaning onto place described earlier. The pictures elicited information from a group and therefore, can be conceived of as an *applied visual public ethnography* in other words a multi-layered description of place (Pink & Hjorth, 2012:440).

Pink (2011) describes participatory photography as a method of knowledge creation or an applied visual anthropology(Pink, 2011). Ingold (2011:241) has pointed out that an ethnography is not anthropology or critical discourse on culture but a careful and detailed description of culture. In this research, photography is a method for a detailed description of place, where photography of the everyday or vernacular reveals local knowledge. Therefore, the outcome of this participatory process, as an applied practice, following Pink (2011), and with the unexpected public participation, is in the final analysis, an *applied public visual ethnography*.

The agency of visual stories.

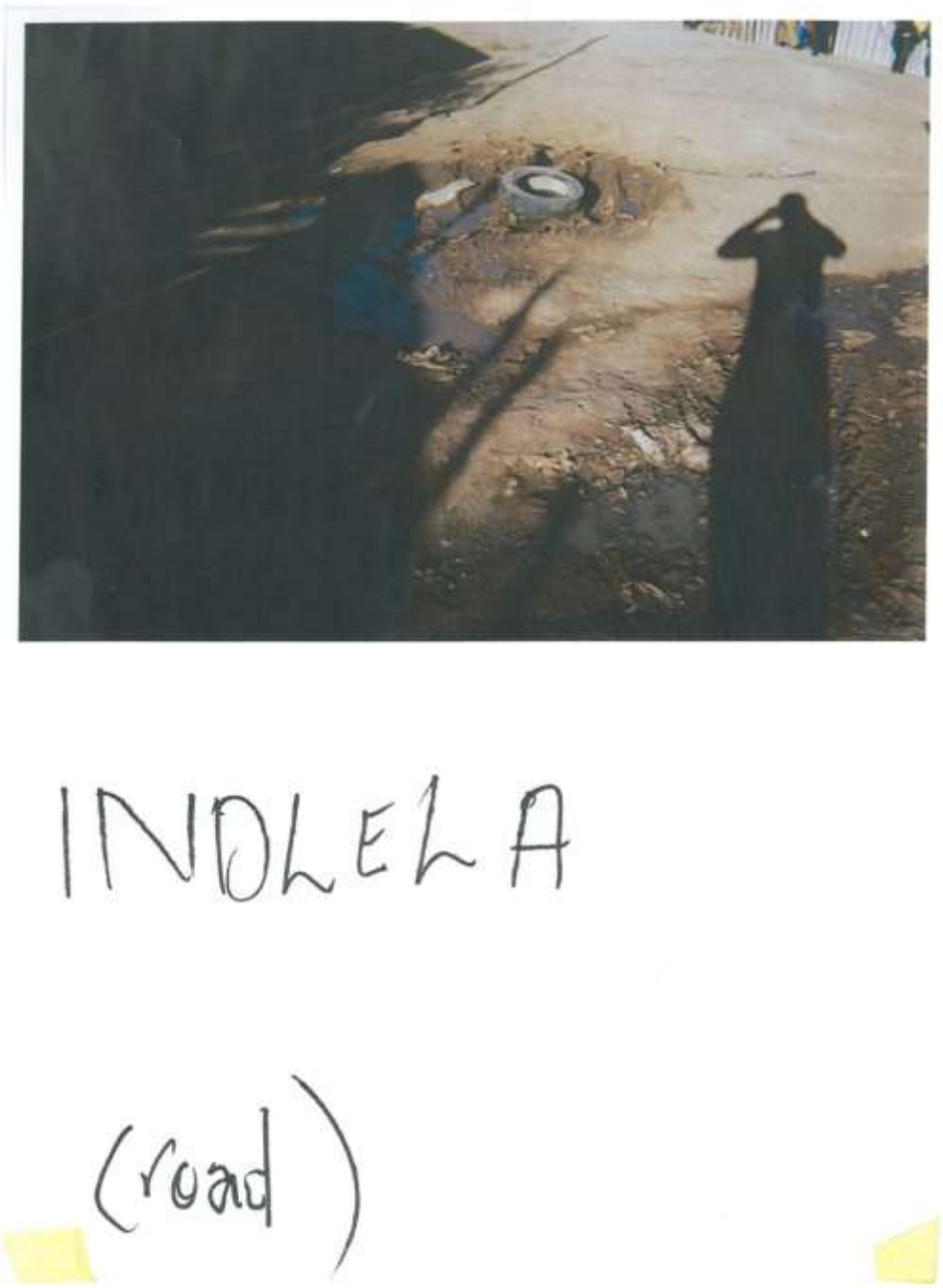

Figure 3:27: Indela (road). Informant Photograph: Participatory Photography Project, Enkanini

The tools of visual storytelling need living contexts to be meaningful, and active, in constructing further meaning (Galbiati, Bertolotti, Mattana, *et al.*, s.a.:10). The photographs on exhibit revealed themes and descriptions about place as an ethnography and momentarily sparked a public into being which elicited further knowledge and at the same time embedded meaning into the place they represent.

The capacity of visual storytelling facilitates learning processes because it makes complex stories visible (Manzini, Walker & Wylant, 2008). Photography is a useful tool for knowledge co-creation in TDR methodology as the camera is an instrument of participation. Additionally, the viewer of a photograph is participating and complicit in what is represented even if it is the pain and poverty of others (Sontag, 1977:12). In this way, participatory photographs made as a social activity in community engagement have agency in activating collective identity and strengthening social capital (Banks, 2001:25).

This photo-elicitation process as a public participatory visual ethnography (Pink & Hjorth, 2012:440) is a narrative, which could be shown downstream and link different social networks in the meaning of the place of Stelenbosch.

However, the research did not reach this objective as I will now explain. When I presented the photographs to the funders, the options for exhibition did not seem suitable. These included an upmarket gallery, a boardroom, or the possibility of bringing a well-resourced group as visitors to an exhibit in Enkanini. All these locations risked evoking notions in the viewer of an *other* or *victim* because the images show poverty. The viewer in these sites would largely be from different material circumstances and the voyeur of difference (Parvez, 2011). The images alone, therefore, would not be sufficient to link networks in a spirit of equal and humanity

Björgvinsson, Ehn & Hillgren (2012:128) argue, that to make visible or articulate difference using media is a catalyst for change. However, in this case, the relevance of this media remained only in the place it was made rather than as a bridge across social difference. Nevertheless, this is still a relevant outcome as the photographs worked as containers of meaning that amplified community to the community they represent. In sum, they built knowledge and in this way benefited the Enkanini neighbourhood as a narrative of place.

Section Four: Activating publics.

The proposal that the photographs momentarily sparked a public into being at the exhibit in Enkanini follows the literature from Sontag (1977) and others (Chaplin, 2005; Parvez, 2011; Chaplin, 2005; Banks, 2001, 2007; Harper, 2010) about characteristics specific to images, the visual narrative as a device for constructing meaning (Pink & Hjorth, 2012); the cues narrative employs:(Herman, 2009; Horstkotte, 2009; Mang & Reed, 2011; Ingold 2011) and the agency of the visual in participatory processes (Björgvinsson, Ehn & Hillgren, 2012; Ernston & Sorlin, 2009; Pink, 2011; Tacchi, Watkins & Keerthirathne, 2009).

Relational aesthetics

As I have discussed in Article One, the visual creative process is a way of conceiving of future scenarios (Puleo, 2014:579).

Activating publics in self-organized social assemblages taps into the creative capabilities of society. In the literature, design thinkers (Björgvinsson, Ehn & Hillgren, 2012, 2010; Latour, 2008) describe activating self-organized, participatory publics as an evolutionary way for society to innovate for sustainable development (Björgvinsson, Ehn & Hillgren, 2012, 2010; Soufalis, 2009). These are new milieus of participation or social innovation (Manzini, 2014). In these new milieus, messy, unfinished artefacts are good outcomes (Björgvinsson, Ehn & Hillgren, 2010; Galbiati, Bertolotti, Mattana, et al. s.a.). Björgvinsson, Ehn and Hillgren (2012:131) write, partial artefacts are in the domain of experimentation.

Visual objects such as photographs contain complex, diverse narratives (Puleo 2014:571) and can link people and places, weaving these together (Bourriaud, 2002:18). As Bourriaud (2002:162, in Guattari 1968) describes; "Community can be formed in relation to the work and can surface other concerns, building participation at a neighbourhood level". Björgvinsson et al. (2012:128) describe the agency of the visual as supporting "opportunities of articulating a public rendered invisible by hegemonic social and business logic". Andrews (2011:47) suggests this is because humans are "motivated by aesthetics and emotive appeal over logic". Polli (2011) finds that art can promote new forms of activism that lead to social transformation (Polli, 2011:19).

Ose (2014:33) identifies a recent trend in the arts in Africa in projects that explore how to co-create knowledge from a particular place. With this in mind, Ose (2014) asks how art interventions, (or creative social activities) can produce solutions in the urban environment and create new social forms or counter cultures. Ose (2014:32) asks what role these new forms of art in the public sphere can contribute, surpass a state-dominated or imposed space. These questions reinforce the direction of the argument in this thesis that a local identity can emerge through the use of a creative medium, such as photographs. Ose (2014) thoughts also link to the question first posed at the beginning of the thesis, of sustainability as a social movement how can artists and cultural projects inform issues relevant to urban space, the public sphere and sustainability?

Measuring and evaluating.

Le Roux and Constandius (2013:117-118) echo Ose (2014) when they ask, what is the zone of influence of art and can it be part of an integrated solution? Other questions that emerge are; what is the shared and measurable outcome of art interventions and how is the work sustained after the creative practitioner has left? In sum, what direct impact or influence does the work hold and is there social transformation?

Suzanne Lacy, an artist working in community argues that it is not the role of the artist to measure (Lacy as in Young, 2012:17). Although she notes that to claim work is for social change, impact must be measured. However as an artist, she is not interested in proving something using, in her words, ‘hard-core research methodology’ (Lacy as in Young, 2012:17). Lacy argues that instead, aligning vision and values creates change (Lacy as in Young, 2012:17). In a zone of influence, results are not immediate, instantaneous or visible. Opting for producing immediately possible outcomes, as Le Roux and Constandius (2013:118) point out, may create long-term, unintended consequences as seen in the Breitenberg study.

The result of this case study is a messy, unfinished artefact in a safe-to-fail experiment (Snowden 2013). Used openly, researchers learn from failures and semi-finished artefacts (Snowden, 2013; Galbiati, Bertolotti, Mattana, *et al*., n.d.; Manzini, 2014c). A failure writes Manzini (2014b) is what feeds new developments. Local knowledge has something to say even when part of an overarching project that may not have reached its objectives (Manzini 2014b). Additionally, giving voice using visual narrative to

vulnerable people does not guarantee inclusion in a wider social discussion. Nevertheless, it is useful to have locally produced content for generating future debate (Tacchi, Watkins & Keerthirathne, 2009).

Ideas do not always converge, but there is arguably a role for experimental spaces (Snowden, 2013). Evident in much of the literature reviewed for this thesis, for example in Soufalis (2009), Mang & Reed (2011), Du Plessis (2011), Manzini (2014C), Bahadur & Tanner (2014), Swilling & Annecke (2012) and Hamdi (2014), is that in this time of extreme change where experimental thinking is a necessity. Innovative ways of creating knowledge Ernston et al. (2010) find, contribute to understandings of sustainability as a social movement.

Conclusion of Article Two

As I mentioned in Article One in regenerative design, one of the first steps of designing or rethinking is to look at story of place. Story, Mang and Reed (2012:26) write is a common form of sharing knowledge about values, memory and identity. Stories are a tool for dialogue that connects people to place over time and are fundamental to the way people learn because human memory is story-based not data based (Mang & Reed 2011:29 as in Schank 1995).

The visual methods used in this research create narratives that are accessible. As a story of place, they elicit further knowledge. The outcome of this research is a beginning from which to grow a larger narrative about the place of Stellenbosch as it relates to the shared system of its river.

The research began at the Enkanini Research Center with a straightforward goal of participatory photography as a method for knowledge creation about the place of Enkanini as it relates to the river. The research fell short of reaching the objective of connecting social networks upstream with downstream to strengthen local identity. Implementing the participatory photography workshop proved to be harder than anticipated. Following a flexible TDR approach of learning from feedback, a method of engaging in Enaknai had to be construed. Walking and conversation led to an opportunity to facilitate a participatory photography workshop about the place of Enkanini.

In sum, I first had to understand how to engage with Enkanini residents who had different social, economic and cultural backgrounds than myself, which took a lot of time and the focus away from the river.

Nevertheless, in this research, I was able to establish some findings on the river and its meaning in Enkanini. Embedded in these results are social and economic vulnerabilities, which influence ecosystem vulnerability. The lack of sanitation and the vulnerable women living alongside the river, as well as the nameless streams, are some examples. Other examples include the social, spatial arrangement of the town of Stellenbosch and the historic occupation of the river.

Visual methods are often used in co-research as a technical solution to overcome the barrier of communication where there are language differences. However, the agency of photographs extends beyond illustration. In this case study, the visual language of photography functions as a boundary object or knowledge building tool and contributes to the collective knowledge and understanding of place. In this way, photographs reinforce meaning of place and are tools for strengthening local identity, which arguably builds social capital and local resilience. This is relevant in the Anthropocene. The photographs made by these five residents of Enkanini revealed place and at the same time through the response to the sensory and narrative nature of images, a wider narrative of place was activated. The photographs and their subsequent texts reveal how a community sees their environment and shows the sensory materiality of their lives in ways that a viewer can empathetically understand' (Pink, 2007b:250). In an emergent and novel outcome, the photographs became a public visual ethnography of place (Pink, 2011), and this collective social action added further meaning to the images.

In sum, I had to relinquish control of the original objectives of the research and rather find meaning in the way things unfolded. The outcome of a public visual ethnography of place was possible because of these flexible and slow methods. The aim of the research, to answer the question of how can a community care for its river led to building systems knowledge in an immersive strategy including the co-production of knowledge in one neighbourhood that makes up the complex environment of the Eerste River watershed.

CHAPTER FOUR: FINDINGS

Introduction

The research has used literature to examine how a community could care for its river by connecting community to place to engender identity and care. Below is a discussion of the findings from the study in Stellenbosch and Enkanini.

In the first part of this chapter, I aim to show the insights that emerged when producing systems knowledge through the research methods of a visual survey, structured and unstructured interviews, walking and conversation. In the second part of the discussion, I provide evidence that photography is a means of eliciting collective knowledge and cultivates connectedness. I use the case study to substantiate this and discuss insights from the participatory photography method.

Finally, I aim to show how this study benefitted from a flexible and iterative TDR methodology.

The Eerste River

In Article One the river is located as a lens on the uneven development of the town of Stellenbosch. I propose the river is also an instrument with which to re- imagine a place to build commonality. This approach reveals the complex and mutual relationships between society and the river in Stellenbosch. Stellenbosch is contained within an ecosystem boundary of a watershed. In the systems knowledge developed by this study, the following findings stand out.

Informal methods of waste disposal.

The health of the Eerste River as the main channel of the watershed is influenced by the collective society around it. All the rivers that run through neighbourhoods of Stellenbosch town are connected to the Eerste River and contribute to its polluted state (Fig 1). Therefore, the river reveals the weaknesses of the larger system. In particular, this weakness is found in;

1. Weak waste infrastructure in the informal settlement of Enkanini.

2. Ageing and weak formal waste infrastructure that cannot meet the demands of new development.

3. Both contribute to the pollution of the river equally.

In the first case, evidence of technical weaknesses in informally built areas in the watershed can be seen in the example of waste containers that are open to weather and animals, so waste becomes quickly scattered. Although there have been municipal contracts offered to employ residents of Enkanini to assist in the collection of waste, they are short term, possibly due to a change in the Municipal Manager. This solid waste enters the river through water runoff and weakens the health of the river.

Additionally, the study found evidence of grey water disposal by households in Enkanini alongside roads. In hot summer months, the water in these channels stagnates and is a potential breeding ground for pathogens. The study found further evidence of pollutants in Enkanini. Blackwater (sewage) from manholes regularly overflows due to blockages from the use of paper and cement bags instead of toilet paper. Slowly and eventually everything runs downstream and seeps into the Plankenbrug River, which joins the Eerste River.

As a result, of urban runoff, The Eerste River and its seasonal streams run year round (Barnes, 2013). The polluted urban runoff amplifies the vulnerability of a natural system in an urban center. While the technical failure of waste management in the informal settlement directly affects the river, the river also becomes a health hazard in Enkanini thereby exposing the already vulnerable settlement to health risks.

Formal systems of waste disposal.

Management of waste in the orthodox or traditional waste infrastructure contributes to the polluted river equally. Ageing infrastructure that carries waste through town leaks into the Plankenbrug River (Barnes, 2015). The formal waste-water infrastructure is an unsustainable orthodox model locked into an obdurate use of fresh water to flush waste. This flush and forget system (Sebitosi, 2013) is an unsustainable use of fresh water particularly in a drought sensitive country. The interpretation of this study is that there is a lack of imagination to design ecologically friendly, closed loop systems. Evidence of this is in an existing under-utilised end-waste management system at the wastewater

treatment plant. An equipped sewage sludge composting facility including a shed, loading belt and composting system, at the Municipal Works, is no longer in use, despite the limitations of the land in Stellenbosch for waste sludge disposal.

Another example of orthodox thinking and obdurate infrastructure that contributes to the unsustainable state of the river includes the cement channels alongside roads that accelerate storm water into the sewage drains. These downhill channels run in straight lines downhill, and their design accelerates the water runoff from roads. In heavy rains, the speed of water entering the drains compounds an existing problem. When too much water rapidly enters the drains from the roads, it stretches the capacity of the sewage Works to manage volumes to its limit. To offset these volumes, rainwater mixed with the sewage bearing water is channeled down a hidden 'skelm sloot' [44]at the Works, to the Veldwachters River (Barnes, 2015; Kloppers 2014). The Veldwachters River connects to the Eerste River at the sewage works.

As a result, informal and formal technical infrastructure weakness in the Eerste River Watershed culminates in the Eerste River.

Society

In collecting systems knowledge, the study also identified unequal social systems that contribute to fragmented ideas of the river.

These findings are;

a. Powerful social networks have historically occupied the river's resource of water and laid the foundation of uneven development and a fragmented sense of place.
b. The river is not vital to the town for economic reasons, and the polluted water is seemingly not a relevant problem.
c. The study found a fragmented idea of the physical geography of the river system, one that perpetuates a misconception that the problem of the river

[44] A 'skelm sloot' is a sly ditch.

consists of separate parts. Evidence of this is in the narrative of the river found in the local paper as a crisis of different rivers.

d. Well-resourced social groups refer to the poor using the word community. Therefore, the idea of ‘community’ is a fragmented and weak concept.

Evidence of how the socially powerful institutions occupy the river is in the historical spatial layout of the town of Stellenbosch. The main government building occupied land on the river, and the government owned the wheat grinding mills, instruments of the town's economy powered by the river. Apartheid era structures perpetuate these divisions.

Secondly, the river is not visibly relevant to the Stellenbosch's economy, despite the economic benefit from surrounding agriculture. The town’s water comes from the unpolluted Jonkershoek River. The relevance of the river is now as an empty construct for a heritage festival. Ironically, at this festival, the polluted river water is flushed out with water from the Theewaterskloof dam.

These social and technical findings provide insights into an unequal town with a fragmented sense of place and identity, despite that Stellenbosch is unified geographically in a single ecosystem boundary of a watershed.

Methods of engagement

The second proposal of the research is to link diverse networks in a shared sense of place by articulating diversity using a shared objects or boundary object, in this case, of photographs. The case study of this research applied the theory of Article One to a participatory photography method of knowledge co-creation in Enkanini.

The participatory photography workshop revealed further social fragmentation or divisions. Despite the goal to facilitate the articulation of difference using photography, the objectives of this researcher as facilitator did not match those of the co-researchers. In Enkanini, unexpected shifts in social assemblages happened without warning. Evidence of this is in the way the ERC Sanitation Cooperative dissolved, and the relationships in this study between researchers and co-researchers fell apart.

The analysis of this feedback was that understanding the socially, and economically vulnerable part of Stellenbosch meant being flexible as a researcher and taking a slower

and multi-layered approach to engaging in research with residents. The study followed a flexible TDR approach and re-framed this understanding as a new problem. The mixed research methods of this new problem are framed as *methods of engagement.* The new goal was to be responsive to the context of engaging as a researcher in an unknown social network.

My observation echo Mitchell and de Lang (2011), that it is crucial to take the time to know the social issues and dynamics of informality if one is planning to work in this space with participatory media. It is critical to explore the ways in which residents cope, their values and goals, and the community psychology (Mitchell & de Lange, 2011:173). It requires as Mitchell, and de Lang (2011:173) write, working “deeper not wider”, and not “in and out” but in long term projects where researchers need to relinquish control (Mitchell & de Lange, 2011).

The study found the immersive methods of walking and conversation were ways to begin to produce knowledge about the community. Pink (2007:240-245) finds walking a research method informed by sensory qualities. In its sensory capacity, where the senses perceive the environment, walking is, in her opinion, an embodied experience. Pink encapsulates the meaning of embodiment; "place is sense, sense is place, as places make sense, sense makes place (Pink, 2007:40, in Feld and Basso, 1996:61)”. Following the literature of Casey (1996), Ingold and De Certeau (1986), Pink considers walking to be a way of making a place in how we gather together knowledge of a place.

In the study, a strong parallel emerged between walking and photographs as knowledge tools. Indeed, Pink (2007:245-250) finds a walked pathway, and a photograph are both knowledge events that fix for a moment the social interaction of an environment and enable a sense of the materiality of place.

Public visual ethnography.

Despite these methods of engagement, and the context of the researcher at the ERC, addressing the problem of the river with co-researchers from Enkanini, was not that simple. The vulnerable nature of Enkanini means that its relationship to natural resources such as the river is easily overlooked by residents.

However in order to contextualise the participatory photography engagement this study focused on the exercise as a study of place. The participatory photography, therefore, revealed knowledge of place using visual means.

Photographs communicate in sensory ways that are understood as embodied experiences that can spur an 'empathetic engagement' Pink (2007b:250) with what is represented. A final set of findings was the empathetic agency of the visual. This is evident in the emergent outcome at the exhibit of images taken during the participatory photography workshop. The public presentation elicited public participation following Pink (2007), as an open ethnography about place. The agency of images was evident in the collective meaning assigned to each photograph during the exhibit by the public audience.

These findings echo Mitchel and de Lange (2011) findings. They (Mitchel & de Lange, 2011) write that visual agency lies in the social construction of knowledge through collective reflexivity. In other words, visual narratives elicit stories actors can relate and respond to (Mitchell & de Lange, 2011:173–174). These authors note that there are ways "visual methods strengthen social fabric" and "can shift consciousness and behaviours and can be used for social change (Mitchell & de Lange, 2011:183)". Although these comments refer to the long term potential of participatory media, I found this to be the case in the short time span of the exhibit.

Thus, the findings from participatory photography method reinforced the second proposal of photographs as shared knowledge-building tools. The public visual ethnography is evidence of how a photograph contains meaning that can be shared to build knowledge about identity and place. These findings are confirmed by the research of Banks (2007), Edwards (2011) Harper (2010), Lapum et al. (2012) and Mitchell and de Lange (2011) where a photograph is a container of layered knowledge and can activate collective meaning. In this way, the agency of the visual can connect social groups (Mitchell & de Lange, 2011:173). In such a participatory photography method as the one carried out in this study, the aesthetic is, as Guattari (2006:80) puts it; "not simply occupying the unemployed and marginalised in community centres, it is in the realm of knowledge production".

Transdisciplinarity

The flexible and iterative nature of TDR allowed this study to be responsive to the emergences and context of the study and adapt accordingly. Rather than staying set on the original proposal to connect diverse networks, the study responded to the difficulty of engaging in Enkanini by focusing on ways to engage. Mixed methods of engagement led to the co-creation of knowledge with residents, using images and texts about the place of Enkanini.

Conclusion

Stellenbosch contains many complexities and diversities. In this way it is a microcosm of South African society. To transform the type of urbanism that weakens natural system such as the example of the river described in this study means engaging in the difficulties of African cities.

Pieterse (2010) urges a practice he calls ‘multiple modernity’s’ to connect networks and strengthen local resilience (Pieterse 2010a). In other words, addressing how people live in a modern city is not the realm of one single story. The single story is something Adichie (2009) has also cautioned against (Adichie, 2009). There are multiple narratives of ordinary life and many stories of social practices from any one place. A singular story of place can reinforce a singular concept of place. One meaning of a place will not serve everyone who lives in that place. Therefore, ways of describing a place that easily fits into pre-conceived ideas and that can be imposed on people would not necessarily work in African cities because of the constantly changing dynamics, particularly for example in the informal sector. Rather different stories of place must connect to create a sense of local identity toward engendering care about place and the natural resources within which it located

This flexible study reveals the effort required to engage with part of a socially diverse system when using the river as an instrument for defining a shared place. Photography provides a democratic tool to extend such a study. As a contribution, for now, the methods of engagement in this research may be useful to future researchers studying in the area.

REFERENCES

Adger, N. (2000) Social and Ecological Resilience; Are They Related? Progress in Human Geography, 24 3:347–364.

Adichie, C. (2009) The Danger of the Single Story. online. Available: www.ted.com/talks/chimamanda_adichie_the_danger_of_a_single_story. [2014, 5 October].

Alexander, C. (1979) The Timeless Way of Building. New York: Oxford University Press.

Anon (2015) On The Commons. . 11 September 2015. Available: http://www.onthecommons.org/about-commons.

Atkinson-Palombo, C. & Gebremichael, M. (2012) Creating a Learning Organization to Promote Sustainable Water Resources Management in Ethiopia. Journal of Sustainability Education, 3.

Atwood, B. (2012) Lessons in linking Sustainability and Development.

Bahadur, A. & Tanner, T. (2014) Transformational resilience thinking: Putting people, power and politics at the heart of urban climate resilience. Environment and Urbanization, 26 200.

Baker, K. (2007) Jim Goldberg's brave images are more than just art. San Francisco Chronicle, 3 November. Available: http://www.sfgate.com/entertainment/article/Jim-Goldberg-s-brave-images-are-more-than-just-art-3301514.php. [2015, 27 June].

Banks, M. (2001) Encountering the Visual. In Anon. Visual Methods in Social Research. London. 13–49.

Banks, M. (2007) Using Visual Data in Qualitative Research. Los Angeles, London: Sage.

Barnard, B. (2004) Introducing Stellenbosch. Natural, Rural and Urban Landscapes. Stellenbosch: Centre for Geographical Analysis.

Barnes, J. (2015) Interview with Jo Barnes. PhD.

Barnes, J. (2012) Water. Supply and Quality. In Swilling, M., Sebitosi, B. & Loots, R. (eds.). Sustainable Stellenbosch - Opening dialogues. Stellenbosch: Sun Media. 204–214.

Becker, E. (2012) Social–Ecological Systems as Epistemic Objects. In Glaser, M., Krause, G., Ratter, B. & Welps, M. (eds.). Human–Nature Interactions in the Anthropocene: Potentials of Social-Ecological Systems Analysis. London: Routledge. 37–59.

Björgvinsson, E., Ehn, P. & Hillgren, P.-A. (2012) Agonistic participatory design: working with marginalised social movements. CoDesign: International Journal of CoCreation in Design and the Arts, 8 (2-3):127–144.

Björgvinsson, E., Ehn, P. & Hillgren, P.-A. (2010) Participatory design and democratizing innovation. In 29 December 2010 Sydney, Australia.

Blok, A. (2013) Urban Green Assemblages: An ANT view on Sustainable City Building. Science & Technology, 26 1:5–24.

Bourriaud, N. (2002) Realational Form. In Anon. Relational Aesthetics. 11–24.

Bowers, V. (2013) Press Release; Stellenbosch Rivers not at risk.

Buckley, R. & Kallergis, A. (2014) Does African urban policy provide a platform for growth? In Parnell, S. & Oldfield, S. (eds.). The Routledge Handbook on cities of the global South. Routledge. Chapter 11. Available: http://lib.myilibrary.com.ez.sun.ac.za/Open.aspx?id=585159.

de Certeau, M. (1984) Part Three; Spatial Pratcies; Walking in the City. In Anon. The practice of everyday life. Berkeley: University of California Press. Chapter Three.

Chakrabarty, D. (2009) The Climate of History: Four Theses. Critical Inquiry, 35 2:197–222.

Chaplin, E. (2005) The Photograph in Theory. Sociological Research Online, 10 1. Available: http://www.socresonline.org.uk/10/1/chaplin.html. [2015, 25 February].

Chisholm, N. & Woldehanna, T. (2012) Managing watersheds for resilient livelihoods in Ethiopia. :Chapter 8. Available: dx.doi.org/10.1787/dcr-2012-15-en.

City of Cape Town (2005) Greater Cape Town Rivers. Available: https://www.capetown.gov.za/en/CSRM/Documents/State_of_rivers_report_greater(resized).pdf.

Clark, A., Holland, C., Katz, J. & Peace, S. (2009) Learning to see: lessons from a participatory observation research project in public spaces. International Journal of Social Research Methodology, 10 5:345–360.

Cohen, A. (2012) Rescaling environmental governance; watersheds as boundary objects at the intersection between science, neoliberalism and participation. Environment and Planning, 44:2207–2224.

Cole, R.J. (2011) Regenerative design and development: current theory and practice. Building Research & Information, [Online] 40 1:1–6.

CSIR (2012) Atlas of Freshwater Ecosystem Priority Areas in South Africa. Available: http://www.csir.co.za/impact/docs/Final_Freshwater_Atlas_Article.pdf.

Daniels, S. (2011) Geographical Imagination. Transactions of the Institute of British Geographers, 36 2:182–187.

Davis, K. (n.d.) Documenting The Other Half: The Social Reform Photography of Jacob Riis and Lewis Hine. . Available: http://xroads.virginia.edu/~ma01/davis/photography/home/home.html.

Davis, M. (2010) Who Will Build The Ark? The New Left Review, 61.

Denham, G. (2008) Boundary Objects and KM. . 18 October 2008. Knowledge-at-work. Available: http://denham.typepad.com/km/2003/10/boundary_object.html.

Du Plessis, C. (2014) Towards a Regenerative Sustainability. Sustainability Institute, Stellenbosch.

Eikestadnuus (2004a) Funds for the river, toilets. Eikestadnuus, 7 May:10.

Eikestadnuus (2004b) Pollution enjoys wide attention. Eikestadnuus, 5 March:2.

Eikestadnuus (2009) River polluted. Eikestadnuus, 20 March:7.

Eikestadnuus (2004c) Rivers still polluted. Eikestadnuus, 17 December:6.

Eikestadnuus (2004d) Sediment Pollutes River. Eikestadnuus, 13 February:10.

Eikestadnuus, J. 10th (2004e) What is muddying the waters of the Eerste River? Eikestadnuus, 10 January:22.

Ernston, H., van der Leeuw, S., Redman, C., Meffert, D., et al. (2010) Urban Transitions: On Urban Resilience and Human Dominated Ecosystems. Available: www.kva.se/en.

Ernstson, H. & Sorlin, S. (2009) Weaving Protective Stories: Connective practice to articulate holitsic values in the Stockholm Urban Park. Environment and Planning, [Online] 41:1460–1479.

Galbiati, M., Bertolotti, E., Mattana, W. & Piredda, F. (n.d.) Envisioning the City. A design orientated communication process for a sustainable urban transformation.

Girardet, H. (2004) Cities as eco technical systems. Cities People Planet. Wiley Academy. Chapter 6.

Grassseni, C. (2011) Skilled visions: towards an ecology of visual inscriptions. In Banks, M. & Ruby, J. (eds.). Made to be seen. Perspectives on the History of Visual Anthropology. Chicago, London: University of Chicago Press. 19–44.

Greismer, J.R. & Star, S.L. (1989) Institutional Ecology, Translations and Boundary Objects: Amateurs and professionals in Berkeley's Museum of Vertebrate Zoology, 1907-1939. Social Studies of Science, 19 3:387–420.

Guy, S., Marvin, S. & Moss, T. (2001) Urban Environmental Flows: Towards a New Way of Seeing. In Anon. Urban infrastructure in Transition. Earthscan. 22–37: conclusion.

Hadorn, G., Hoffmann-Riem, H., Biber-Klemm, S., Grossenbacher-Mansuy, W, Joye, Pohl, C. Weisamann, U. Zemp, E. (2008) The Emergence of Transdisciplinarity as a Form of Research. In Anon. Handbook of Transdisciplinary Research. Swiss Academy of Arts and Sciences: Springer. 19–42.

Harper, D. (2010) Talking about pictures: a case for photo elicitation. Visual Studies, 17 1:13–26.

Hattingh, J. (2001) Conceptualizing Ecological Sustainability and Ecologically Sustainable Development in Ethical Terms: Issues and Challenges. Annale, 2.

Haysom, G. & Metelerkamp, L. (2012) Agriculture: From vulnerability to viability. In Swilling, M., Sebitosi, B. & Loots, R. (eds.). Sustainable Stellenbosch - Opening dialogues. Stellenbosch: Sun Media. 191–199.

Heritage Committe (2014) Stellenbosch Heritage Committee.

Herman, D. (2009) Narrative Ways of Worldmaking. In Heinen, S. & Sommer, R. (eds.). Narratologia; Narratology in the Age of Cross-Disciplinary Narrative Research. Berlin,: Walter de Gruyter. 71.

Hine, L. (1911) Child Labor in Gulf Coast Canneries: Photo-Graphic Investigation Made February, 1911. The Annals of the American Academy, 38. Supplement: Uniform Child Labor Laws (Jul., 1911),:118–122.

Holling, C.S. (1973) Resilience and Stability of Ecological Systems. Annual Review of Ecology and Systematics, [Online] 4:1–23.

Holling, C.S., Gunderson, L. & Ludwig, D. (2002) In Quest of a Theory of Adaptive Change. In Gunderson, L. (ed.). Panarchy. Washington D.C.: Island Press.

Hopwood, B. & Mellor, M. (2003) Sustainable Development: Mapping Different Approaches. Wiley InterScience, Available: www.interscience.wiley.com.

Horstkotte, S. (2009) Seeing or Speaking: Visual Narratology and focalization, Literature to Film. In Heinen, S. & Sommer, R. (eds.). Narratologia; Narratology in the Age of Cross-Disciplinary Narrative Research. Berlin: Walter de Gruyter.

Hroch, P. (2013) Resiliance vs Resistance: Affectively modulating contemporary diagrams of social resilience, social sustianability, and social innovation. Media Tropes eJournal, IV 1:17–46.

IIC (2014) Integrated Infrastructure Committee meeting.

Infrastructure news (2013) Stellenbosch rivers still in dire straits, says national study. . 14 August 2013. Infrastructure news and service delivery. Available: http://www.infrastructurene.ws/2013/08/14/stellenbosch-rivers-still-in-dire-straits-says-national-study/.

Ingold, T. (2011) Being Alive, Essays on Movement, Knowledge and Description. Oxon, New York: Routledge.

Institue of Contemporary Arts (2014) Graham Harman: Objects and the Arts. . 27 March 2014. Available: https://www.ica.org.uk/whats-on/graham-harman-objects-and-arts.

Irwin, T., Kosoff, G., Tonkinwise, C. & Scupelli, P. (2015) Transition Design 2015. Available: http://design.cmu.edu/sites/default/files/Transition_Design_Monograph_final.pdf.

Kaden, M. (2012) Shared Space-power, heritage, play. In Swilling, M. & Sebitosi, B. (eds.). Sustainable Stellenbosch. Stellenbosch: Sun Media. Ch17: 244–254.

Kahn, F. (2015) Time to reclaim market and state from self-serving elites. Business Day, :Opinion Section.

Kharkhordin, O. (2005) Things as Res publicae. In LaTour, B. & Weibel, P. (eds.). Making Things Public: Atmospheres of Democracy. Cambridge MA: MIT Press. 280–289.

Kirsten, K. (2013) Kallie Kirsten Complaint with photos of Eerste River.

Kloppers, V. (2014) Superintendent Solid Watse Water Treatment Works.

Koskinen, K. (2005) Metaphoric boundary objects as co-ordinating mechanisms in the knowledge sharing of innovation processes. European Journal of Innovation Management, [Online] 8 3:232–335.

Krippendorff, K. (1993) Major Metaphors of Communication and some Constructivist Reflections on their Use. Cybernetics & Human Knowing, 2 1:3–25.

Lapum, J., Ruttonsha, P., Church, K., Yau, T., et al. (2012) Employing the Arts in Research as an Analytical Tool and Dissemination Method : Interpreting Experience Through Aesthetic. Qualitative Inquiry, 18 100:100–115.

LaTour, B. (2008) A Cautious Prometheus? A Few Steps Toward a Philosophy of Design (with Special Attention to Peter Sloterdijk. In Keynote. 3 September 2008 Falmouth, Cornwall.

LaTour, B. (2005) Reassembling the Social: An Introduction to Actor-Network-Theory. Oxford, England: Oxford University Press.

Leach, N. (2002) Belonging: Towards a Theory of Identification with Space. In Hillier, J. & Rooksby, E. (eds.). Habitus: A Sense of Place. England: Ashgate Publishing Company. 281–299.

Leavy, P. (2011) Essentials of Transdisciplinary Research. California: Walnut Creek: Left Coast Press.

Le Roux, K. & Constandius, E. (2013) The viability of social design as an agent for positive change in a South African context: Mural painting in Enkanini, Western Cape. Image & Text: a Journal for Design, 21:106–120.

Lippard, L. (2011) Imagine being here now1. Landabréfið, 25. Available: http://landfraedi.is/landabrefid/2011/Landabrefid_2011_LL.pdf.

Mang, P. & Reed, B. (2011) Designing from place: a regenerative framework and methodology. Building Research & Information, [Online] 40 1:23–38.

Manzini, E. (2014a) Cultures of Resilience. Philosophy Talk. Design for Sustainability and Social Innovation (DESIS). Cape Peninsula University Tech (CPUT). Cape Town.

Manzini, E. (2014b) Design for social innovation vs. social design. . 7 August 2014. DESIS Network: Design for Social Innovation and Sustainability. Available: http://www.desis-network.org/content/design-social-innovation-vs-social-design.

Manzini, E. (2015) Design, in a changing, connected world. Strategic Design Research Journal, 7 2:95–99.

Manzini, E. (forthcoming) Design in a connected world. In Anon. Design when everybody designs. MIT Press.

Manzini, E. (2011) The New Way Of The Future: Small, Local, Open And Connected. New Social Models, :100–105.

Manzini, E., Chisin, A., M'Rithaa, M. & Snaddon, B. (2015) Under the Wawa Tree. forthcoming.

Manzini, E. & Rizzo, F. (2011) Small projects/large changes: Participatory design as an open participated process. CoDesign, [Online] 7 3-4:199–215.

Manzini, E. & Staszowski, E. (2013) Public and Collaborative: Exploring the Intersection of Design, Social Innovation and Public Policy. DESIS network. Available: http://www.desis-clusters.org/.

Manzini, E., Walker, S. & Wylant, B. (2008) Design Contexts: Enabling Solutions for Sustainable Solutions. Clagary Alberta: University of Calgary Press.

Max-Neef, M. (2005) Foundations of Transdisciplinarity. Ecological Economics., 53 1.

Max-Neef, M. (1983) From the Outside Looking In: Experiences in Barefoot Economics. Zed Books Ltd.

Mebratu, D. (1998) Sustainability and Sustainable development: Historical and Conceptual Review. Environmental Impact Assessment Review, 18:493–520.

Media24 (2015) Eikestadnuus. . 2015. Available: http://www.media24.com/newspapers/eikestadnuus/.

Mitchell, C. & de Lange, N. (2011) Community-based participatory video and social action in Rural South Africa. In Margolis, E. & Pauwels, L. (eds.). Sage Handbook of Visual Research Methods. Los Angeles: Sage. 171–183.

Negash, M., Hassan, S. & Muchie, M. (2014) Misplaced opposition to the Grand Ethiopian Renaissance Dam. Sudan Tribune, 30 April. Available: http://www.sudantribune.com/spip.php?article50822.

Newman, D. & Paasi, A. (1998) Fences and neighbours in the postmodern world: boundary narratives in political geography. Progress in Human Geography, [Online] 22 2:186–207.

NL Agency Ministry of Foreign Affairs (2012) Stellenbosch Urban River Basin Management Project.

Ostrom, E. (2009) A General Framework for Analysing Sustainability of Social-Ecological Sytems. Science, [Online] 325 419.

Parnell, S. & Pieterse, E. (2014) Africa's Urban Revolution in Context. In Anon. Africa's Urban Revolution. London, New York: Zed books. 1–17.

Parvez, N. (2011) Visual representations of poverty. City: analysis of urban trends, culture, theory, policy, action, 15 6:686–695.

Pieterse, E. (2008) City Futures. London, New York: Zed books.

Pieterse, E. (2010) Cityness and African Urban Development.

Pink, S. (2007a) Doing Visual Ethnography. London. Thousand Oaks, New Delhi: Sage Publications.

Pink, S. (2011) Images, Senses and Applications: Engaging Visual Anthropology. Visual Anthropology, [Online] 24 5:437–454.

Pink, S. (2007b) Walking with video. Visual Studies, 22 3.

Pink, S. & Hjorth, L. (2012) Emplaced cartographies: reconceptualising camera phone practices in an age of locative media. Media International Australia incorporating Culture and Policy, 145. Available: http://go.galegroup.com.ez.sun.ac.za/ps/i.do?id=GALE%7CA322564531&v=2.1&u=27uos&it=r&p=AONE&sw=w&asid=3db7b8d8688171b8d79eb0d2a53a7a88.

Polli, A. (2011) Breathtaking. In Proceedings of the Media Ecology Association. 2011

Puleo, T. (2014) Art Making as Place making following disaster. Progress in Human Geography, 38 568.

Raper, J. (2004) New Dictionary of South African PLace Names. Johannesburg: Johnothon Ball.

Robinson, B. (2012) Ecosystem Services-Protecting Stellenbosch's natural systems. In Anon. Sustainable Stellenbosch. Stellenbosch: Sun Media. Chapter 15: 215–226.

Rony, F.T. (2006) The Photogenic Cannot Be Tamed: Margaret Mead and Gregory Bateson's Trance and Dance in Bali. Discourse, 28 1:5–27.

Rutherford, J. (1990) The Third Space: Interview with Homi Bhabha. In Anon. Identity: Community, Culture, Difference. London: Lawrence and Wishart. 207–221.

Ryan, J. (1997) Picturing Empire. University of Chicago Press.

Sachs, W. (1999) Sustainabile Development and the crisis of nature: On the poltical anatomy of an Oxymoron Fischer, F. & Hajer, M. (eds.). Living with Nature: environmental politics as cultural discourse, :23–41.

Satterthwaite, D. (2007) The Scale of urban change worldwide 1950-2000 and its underpinnings. London: International Institute for Environment and Development., :26–37.

Sebitosi, B. (2012) Sanitation. In Swilling, M. & Sebitosi, B. (eds.). Sustainable Stellenbosch. Stellenbosch: Sun Media. Ch9:139–150.

Sherwood, S., Paredes, M. & Ordóñez, A. (2014) Moving from communication as profession to communication as being in Northern Ecuador. In Mendizabal, E. (ed.). Communicating Complex Ideas: Translating Research into practical social and policy changes. On Think Tanks. 13–31. Available: https://onthinktanks.files.wordpress.com/2014/06/communicating-complex-ideas_full-book.pdf.

Shore, S. (2010) The Nature of Photographs: A Primer. New York, NY: Phaidon Press.

Shurmer-Smith, P. (2002) Doing Cultral Geography. Shurmer-Smith, P. (ed.). London: Sage.

Shuttleworth, K. (2012) Agreement entitles Whanganui River to legal identity. . 30 August 2012. The New Zealand Herald. Available: http://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=10830586.

Singh, A. (2011) Visual artefacts as boundary objects in participatory research paradigm. Journal of Visual Practice, 10 1:35–50.

Sneddon, Howarth, R. & Norgaard, R. (2006) Sustainable development in a post-Brundtland world. Ecological economics., 57 2:253–268.

Snowden, D. (2013) Snowden workshop. In Workshop. 21 October 2013 Stellenbosch Institute for Advanced Study.

Sontag, S. (1977) In Plato's Cave. In Anon. On Photography. New York: Picador.

Soufalis, Z. (2009) Social Construction for the Twenty-first Century: A Co-Evolutionary Makeover. Australian Humanities Review, May. Available: http://press.anu.edu.au/wp-content/uploads/2011/04/essay071.pdf.

Speed, R., Le Quesne, T., Pegram, G., Yaunyuan, L., et al. (2012) Strategic Basin Planning. Available: awassets.panda.org/downloads/1_basin_water_planning_web.pdf.

State of California (n.d.) California Watershed Program. Available: http://www.conservation.ca.gov watershed@conservation.ca.gov.

Statistics South Africa (2015) Statistics by Place/Local Municipality/Stellenbosch. . 2015. Statistics South Africa. Available: http://www.statssa.gov.za/?page_id=993&id=stellenbosch-municipality.

Stiglitz, J. (2002) Globalization and its Discontents. New York: W.W. Norton & Company.

Swain (2006) Languaging, agency and collaboration in advanced second language proficiency. In Byrnes, H. (ed.). Advanced Language Learning: The contribution of Halliday and Vygotsky. London: Continuum. 95–108. Available: lrc.cornell.edu/events/past/2011-2012/papers11/swain.pdf.

Swilling, M. & Annecke, E. (2012) Just Transitions. Explorations of sustainability in an unfair world. Tokyo, New York, Paris: United Nations University Press.

Tacchi, J., Watkins, J. & Keerthirathne, K. (2009) Participatory Content Creation; voices, communication and development. Development in Practice, 19 4-5:573–584.

Tavener-Smith, B. (2012) Housing. In Swilling, M. & Sebitosi, B. (eds.). Sustainable Stellenbosch. Stellenbosch: Sun Media. ch4:68–83.

Tavener-Smith, L. (2013) Interview with Lauren Tavener Smith, PHD Candidate, Stellenbosch School of public leadership.

Thieme, M., Abell, R., Stiassny, M. & Skelton, P. (2005) Freshwater Ecoregions of Africa and Madagascar. Washington, Covelo, London: Island Press.

Thomas, W. (2012) Local Economic Development. In Swilling, M., Sebitosi, B. & Loots, R. (eds.). Sustainable Stellenbosch - Opening dialogues. Stellenbosch: Sun Media. 84–93.

Tuan, Y.-F. (2002) Community, Society and the Individual. American Geographical Society, 92 3:307–318.

UNEP (2004) Introduction: Basic concepts and Definitions. :30–42.

UN-Habitat (2012) State of the World's Cities: Prosperity of Cities 2012/2013.

Vale, L. (2013) The politics of resilient cities: Whose resilience and whose city? Building Research & Information, 42 2:191–201.

Van Der Ryn, S. & Cowan, S. (1996) An Introduction to Ecological Design. In Anon. Ecological Design. Washington D.C.: Island Press.

Walton, J. (1974) Watermills, windmills and horse mills of South Africa. Cape Town, Johannesburg: C. Struik Publishers.

Wessels, B. (2014) Berry Wessels.

Winthrop, E. (2006) Searching for Addie: the story behind a famous photograph. Social Education, 70 4. Available: http://go.galegroup.com/ps/i.do?id=GALE|A147057616&v=2.1&u=27uos&it=r&p=AONE&sw=w&asid=e8616a0891ae1f4923d250f2f66de692. [2015, 27 June].

World Commission on Environment and Development (1987) Our Common Future. Oxford, England: Oxford University Press.

Yin, R. (2013) Case study research: Design and methods. London: Sage.

Young, P. (2012) The Suzanne Lacy Network. Art in America, Available: http://www.artinamericamagazine.com/news-features/magazine/the-suzanne-lacy-network/.

APPENDIX

Appendix A: An enquiry into watershed management, Tigray, Ethiopia: an Overview

In 2014, I was a research exchange student at the University of Mekelle, Tigray National State, through the Stellenbosch University TRECCAfrica program. My objective was to examine social resilience by understanding the motivation for participation in Integrated Watershed Management (IWM), which is prevalent in this part of Northern Ethiopia. In rural Tigray IWM is the primary ecological management frame for managing land, water and groundwater, and has been for more than twenty years. The origins of this management are several, but the main thrust behind widespread adoption seemingly lies in the people-centred struggle based in the rural north-west Tigray.

IWM is a national initiative, but Tigray is more consistent in its application. The management practice involves terracing the upper watershed's high slopes and building check dams and wider bench terraces and trenches further down the slope, all with the collective goal of slowing water and sinking it back into ground aquifers. Zero grazing and tree planting and composting are other linked activities in IWM. The bench terraces are for farm acreage for landless youth. The labour for terracing land involves hard work in placing the heavy rock on steep slopes, and Tigray is quite striking for the rock walled terracing occupying its highland hills. The labour is implemented in two ways. The first is in a compulsory month of work known as mass mobilization, in February, which coincidentally is the same month as the celebration of the Ethiopian People's Liberation Front (EPLF) victory over the Mengistu's Derg. Regime.

During mass mobilisation, the healthy population, both women and men, work in teams for two to three weeks. Administrators and workers rigorously monitor the work, and each group determines an average amount of labour required per day. This average becomes the expected daily outcome. Thus, the amount of time to complete the work is variable. About 35% of the population is able bodied, and mass mobilisation occurs State-wide. Every district or Woreda in Tigray is broken up into micro watersheds, and some Woredas contain as many as thirty-five micro watersheds. Each February the government implements the mass mobilisation projects.

During the mass mobilisation, the work is compulsory. If people do not participate, they are fined. Management of mass mobilization is multi-level and vertical. The design and implementation of the work of building check dams, bench terraces, water canals and other physical structures in the landscape are part of the participatory management system which starts at the village or *tabia* level and connects with local district and regional district offices.

Each Regional Natural Resource office has three departments; design, implementation and research. Management on all levels participates in some form of mass mobilisation. Atsbi Womberta and Abraha Atsbaha North of Mekelle are successful in replenishing and increasing underground water supplies whereas Adigudum, South of Mekelle has mixed results. Where the underground water replenishes significantly, surface water has returned and benefitted farmers. Some of the successes result from strong partnerships with the NGO sector and year round community participation in IWM. For example, Abraha Atsba holds regular community meetings and trainings all year for IWM. Each Woreda has a farm center that serves as a learning centre and resource for farmers.

Other motivations for participating in IWM is an understanding of the long-term benefits of the IWM program. Where visible improvements provide new or regenerated water sources, people are motivated to follow IWM practices. Another motivation is the food for work program. Tigray is largely dependent on rainwater for irrigation. During the dry months, when the main crops have been harvested and before the new ones are planted, there is food insecurity. *Food for Work* programs fund community work outside of the mass mobilization, and food distribution is carried out by the United Nations World Food Program.

Thus in Tigray, the motivation for caring for the commons is not driven by a metaphoric sense of identity and place, but a dependency on resources. People are compelled to work, and at other times will work for exchange of food. Building local identity through a sense of place by managing place is an emergent construct. Taking a larger view, IWM builds social capital for the country of Ethiopia. Social capital is, as established earlier, arguably a useful proxy measure of social resilience.

The IWM as a policy is very significant to Ethiopia as a political metaphor for autonomy as I will explain below. Ethiopian highlands experience massive rain runoff. Torrential rain on the Tigray highlands feeds into the Tekeze river basin, which joins the Nile basin and flows into the Nile. These Ethiopian Highlands are part of the mega-watershed of the Nile.

Each micro- watershed in Tigray is connected to, first the Tekeze, and then Nile mega-basin. In this way, 80% of the water in the Nile comes from Ethiopia. A 1929 agreement gave Egypt 65% of the Nile water, and the remaining percentage is shared by the upper riparian nations including Ethiopia. Egypt considers Ethiopia's plan to build the Millennium Dam a political threat (Negash, Hassan & Muchie 2014) .

Capturing water is in the Tigray region part of the national identity of the country where 80% is farmland. Participation in the IWM builds social capital and strengthens the resilience and social identity of small regions which contributes to the larger sense of identity of Ethiopia.

In the urban centres such as Mekelle or Addis Ababa, there is no collective management and the river health is poor. The IWM policy exists to offset water poverty and increase food security in the urban areas.

Interviews with key informants included:

Kebele and Tabia leaders and farmer technical experts during mass mobilization projects in K_Awlaelo Wereda and Hintalo Wejirat; Core Natural resource manager in Mekelle; Natural resource manager in Atsbi Womberta Model IWM area; Natural resource manager in Adigudom

The community organiser in Abraha we Atsbaha.